



NATIONAL SENIOR CERTIFICATE EXAMINATION
NOVEMBER 2018

AGRICULTURAL SCIENCES

Time: 3 hours

300 marks

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of 16 pages and an Answer Sheet of 2 pages (i–ii). Detach the Answer Sheet from the centre of the question paper and ensure that it is handed in together with the Answer Book. Please check that your question paper is complete.
 2. This question paper consists of **THREE** sections, namely **SECTION A, B and C**.
 3. This question paper consists of **SIX** questions.
 4. Question 1 must be answered on the Answer Sheet provided. Questions 2–6 must be answered in your Answer Book.
 5. Read the questions carefully.
 6. Start **EACH** question on a **NEW** page.
 7. Number your answers exactly as the questions are numbered in the question paper.
 8. Use the marks awarded for each question as an indication of the detail required.
 9. Non-programmable calculators may be used.
 10. It is in your own interest to write legibly and to present your work neatly.
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SECTION A

Answer these questions on the ANSWER SHEET provided.

QUESTION 1

- 1.1 Various options are provided as possible answers to the following questions. Choose the answer and make a cross (X) in the block (A - D) next to the question number (1.1.1–1.1.10) on the attached ANSWER SHEET. NO marks will be awarded if more than one cross (X) appears for the answer.

EXAMPLE

1.1.11	<input checked="" type="checkbox"/>	A	B	C	D
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- 1.1.1 The _____ is part of the female reproductive tract.
- A Uterus
 - B Vas deferens
 - C Ureter
 - D Viola
- 1.1.2 The genetic interaction responsible for a red calf being born from a mating between a black cow and a black bull.
- A Co-dominance
 - B Complete dominance
 - C Epistasis
 - D Incomplete dominance
- 1.1.3 The male part of the flower is the
- A Petal
 - B Sepal
 - C Stigma
 - D Stamen
- 1.1.4 To compile a soil map of a farm, a farmer would
- (i) dig soil pits on the farm
 - (ii) look at aerial photographs
 - (iii) look at the vegetation growing on the soil
- A (i) only
 - B (i) and (ii)
 - C (ii) and (iii)
 - D (i), (ii) and (iii)

- 1.1.5 A production co-operative is best defined as a group of farmers
- A buying inputs together and splitting them between themselves.
 - B working together to grow and sell their produce.
 - C producing their crops separately but selling their produce together.
 - D growing crops as individuals but on the same piece of land.
- 1.1.6 Precision farming can best be described as:
- A Using the latest technical advances to farm as efficiently as possible.
 - B Using purely inorganic chemicals.
 - C Using organic farming methods.
 - D Looking to the past to find better ways to farm.
- 1.1.7 A rhizome is a
- A disease causing vector in animal production.
 - B part of plant used for reproduction.
 - C disease causing vector in plant production.
 - D one of the digestive enzymes.
- 1.1.8 Asexual reproduction in plants is when
- A pollen from a different plant fertilises the ovum to produce seeds.
 - B pollen from the same plant fertilises the ovum to produce seeds.
 - C a leaf is used to produce new plants through tissue culture.
 - D a seed is planted and allowed to germinate.
- 1.1.9 _____ is not one of the main functions of marketing.
- A Transport
 - B Demand
 - C Storage
 - D Packaging
- 1.1.10 When two double heterozygotes are crossed in a dihybrid cross, the expected genotypic ration is:
- A 1 : 2 : 1
 - B 3 : 1
 - C 1 : 2 : 1 : 2 : 4 : 2 : 1 : 2 : 1
 - D 9 : 3 : 3 : 1

(20)

1.2 Determine whether the statements below are true or false. On the ANSWER SHEET provided mark T for true or F for false.

- 1.2.1 The ovule is the start of a seed in plants.
- 1.2.2 High demand and high production will lead to an increase in the price of the product.
- 1.2.3 Soil surveying is the first step in precision farming.
- 1.2.4 Sepals are part of the sexual organs of the flower.
- 1.2.5 Epistasis is the same as complete dominance.
- 1.2.6 An entrepreneur needs to be over-pessimistic.

(12)

1.3 In the table below, a description and TWO possible answers are given. Indicate whether the description in COLUMN B relates to **A only**, **B only**, **both A and B**, or **none** of the answers in COLUMN A. Make a cross (X) in the appropriate block next to the question number (1.3.1–1.3.5) on the attached ANSWER SHEET.

EXAMPLE:

	COLUMN A	COLUMN B
1.3.11	A maize meal	An example of a concentrate that is rich in protein
	B bone meal	

ANSWER:

This statement refers to:				
	A only	B only	A and B	None
1.3.11	A	B	C	D

	COLUMN A	COLUMN B
1.3.1	A Cutting B Budding	Method of asexual reproduction in plants.
1.3.2	A Clay soil B Loam soil	Soil that is light and does not hold a lot of water.
1.3.3	A Pink flower B Red and white striped flower	An example of complete dominance.
1.3.4	A Supply B Demand	Increases when prices are higher.
1.3.5	A Cross pollination B Self-pollination	Pollination that occurs with pollen between two different species.
1.3.6	A Grapes B Mulberry	A compound fruit

(12)

1.4 Give the correct term for each of the following descriptions. Write only the term next to the question number on the attached ANSWER SHEET.

1.4.1 The act of a seed taking root and starting to grow.

1.4.2 A trait that needs to be measured to be assessed.

1.4.3 The product of sexual reproduction in plants.

1.4.4 Soil particles that swell when wet and make soil heavy.

1.4.5 A market in which farmers can sell their produce to whomever they choose and wherever they choose.

1.4.6 The method of plant reproduction during which only mitotic cell division takes place.

(12)

1.5 Change the UNDERLINED WORD(S) in each of the following statements to make the statements TRUE. Write only the correct word(s) next to the question number (1.5.1–1.5.5) on the attached ANSWER SHEET.

1.5.1 A complete dominance interaction in plants is a pink flower being produced by crossing a red and white flower.

1.5.2 The supply of a product is the amount of that product required by the market.

1.5.3 The textures within a soil profile can be used to classify the soil.

1.5.4 Reproduction through seeds is the best way to produce many identical plants.

1.5.5 During artificial insemination of cattle, the semen is deposited on the vagina side of the cervix.

1.5.6 The petal is the female part of the flower.

(12)

1.6 Choose a term/phrase from COLUMN B that matches a description in COLUMN A. Write only the letter (A–L) next to the question number (1.6.1–1.6.6) on the ANSWER SHEET provided. For example, 1.6.7 Z.

1.6.1	A crop that has been bred to withstand natural pests	A	Gene transfer
1.6.2	Selling one's vegetables together with your neighbour	B	A – Horizon
1.6.3	The implantation of a fertilised egg into a recipient female	C	Equality
1.6.4	The horizon within soils that has a high humus content	D	Genetical Mutated Organism
1.6.5	Point where supply equals demand	E	Production capital
1.6.6	Capital used to plough and plant maize	F	Marketing cooperative
		G	Preparation capital
		H	Embryo transfer
		I	C – Horizon
		J	Equilibrium
		K	Genetically Modified Organism
		L	Production cooperative

(12)

80 marks

SECTION B

Answer these questions in your ANSWER BOOK.

QUESTION 2

A farmer produces peach trees for the nursery market. These trees are all grafted trees, and this is done through a process called budding. The trees are grown for a year before being bagged, tagged and sold to nurseries around the country.

On the farm of 752 ha, only 45 ha are used for tree production. This is because the soil found on these 45 ha is ideal for the production of the peach trees.

- 2.1 Explain how the farmer would go about determining the types of soils found on the farm. (4)
- 2.2 How does the texture of the soil impact on:
- 2.2.1 Irrigation frequency? (2)
- 2.2.2 Water holding capacity? (2)
- 2.3 Soil degradation is a serious problem facing farmers in South Africa. In each of the types of soil degradation below, give a possible cause and a possible prevention measure, making specific reference to the peach tree producer.
- 2.3.1 Physical degradation (4)
- 2.3.2 Chemical degradation (4)
- 2.3.3 Biological degradation (4)
- 2.4 List FIVE negative impacts of soil degradation on agriculture. (5)
- 2.5 2.5.1 Explain what is meant by grafted peach trees. (2)
- 2.5.2 Why is grafting practiced when producing many varieties of fruit and nut trees? (3)
- 2.6 In a table form give TWO advantages and TWO disadvantages of:
- 2.6.1 Sexual reproduction (4)
- 2.6.2 Asexual reproduction (4)

2.7



2.7.1 What is it called when a farmer has more than one enterprise on the farm? (1)

2.7.2 Give the main reason for having more than one enterprise on the farm. (1)

2.7.3 Suggest another enterprise to further ensure the financial viability of the farm? Explain your answer by giving TWO reasons for your choice. (5)

2.8 The farmer is investigating the possibility of producing some of the older varieties of peaches that are not used in many commercial ventures. This is to try and cater for subsistence gardeners who want to produce fruit for their own consumption or use.

2.8.1 What type of market strategy is this that the farmer is trying to develop? (1)

2.8.2 Give FOUR risks associated with this kind of marketing strategy. (4)

[50]

QUESTION 3

Start this question on a NEW page.

Lactation in all mammals is vitally important, but more so in dairy cattle. In a typical dairy enterprise, the cow suckles her calf for 24 hours after calving. After these 24 hours the calf is removed, and the cow returns to the lactating herd. In the lactating herd, the cow will be milked twice or three times per day, depending on the production system used on the farm. In total, the cow will be allowed to lactate for 305 days before drying off.

- 3.1 Name the organ responsible for milk production. (1)
- 3.2 Give the name and function of TWO hormones involved in milk production or milk ejection. (4)
- 3.3 3.3.1 Name the first milk produced by the cow after calving. (1)
- 3.3.2 What makes this milk unique? (1)
- 3.3.3 Why is it important for the calf to suckle from its mother within the first 24 hours of life? (2)
- 3.4 3.4.1 Define mastitis. (2)
- 3.4.2 Give TWO causes of mastitis. (2)
- 3.4.3 Describe FOUR things a farmer could do to prevent mastitis in the dairy herd. (4)
- 3.5 The cattle are fed a mainly pasture-based diet, made up largely of Kikuyu grass that has been over-sown with Rye Grass and Clover.
- 3.5.1 Name TWO ways in which grasses can reproduce. (2)
- 3.5.2 Which of the ways named in Question 3.5.1 is best suited to:
- (a) Planting grass in a small area of a garden? (2)
- (b) Introducing a new species of grass into an existing pasture? (2)
- Give a reason for your answer in (a) and (b).

For the cow to lactate she first needs to calve, and to calve she first needs to be pregnant. With the genetic progress being made throughout the world and availability of semen from anywhere in the world, artificial insemination has become standard practice in the dairy industry.

Some farmers have a person monitoring the cows constantly, recording any signs of heat to ensure that the cow is bred at the correct time. Other farmers prefer to batch their cows and synchronise their breeding through artificial means.

- 3.6 Arrange the steps in the artificial insemination process in the correct sequence. Write only the letters in your answer book.
- A Cover the pistolette with a sheath.
 - B Wipe the vulva of the animal.
 - C Guide the pistolette through the cervix.
 - D Thaw the semen.
 - E Insert the pistolette at an angle 45° .
 - F Load the straw into the pistolette.
 - G Slowly deposit the semen into the uterus.
 - H With a gloved hand, find the cervix through the rectal wall. (8)
- 3.7 Explain how genomics is used in the selection of dairy bulls for use as semen donors for the global dairy industry. (5)
- 3.8 Explain, in your own words, why cloning high producing dairy cows is not a good idea in the dairy industry. (3)



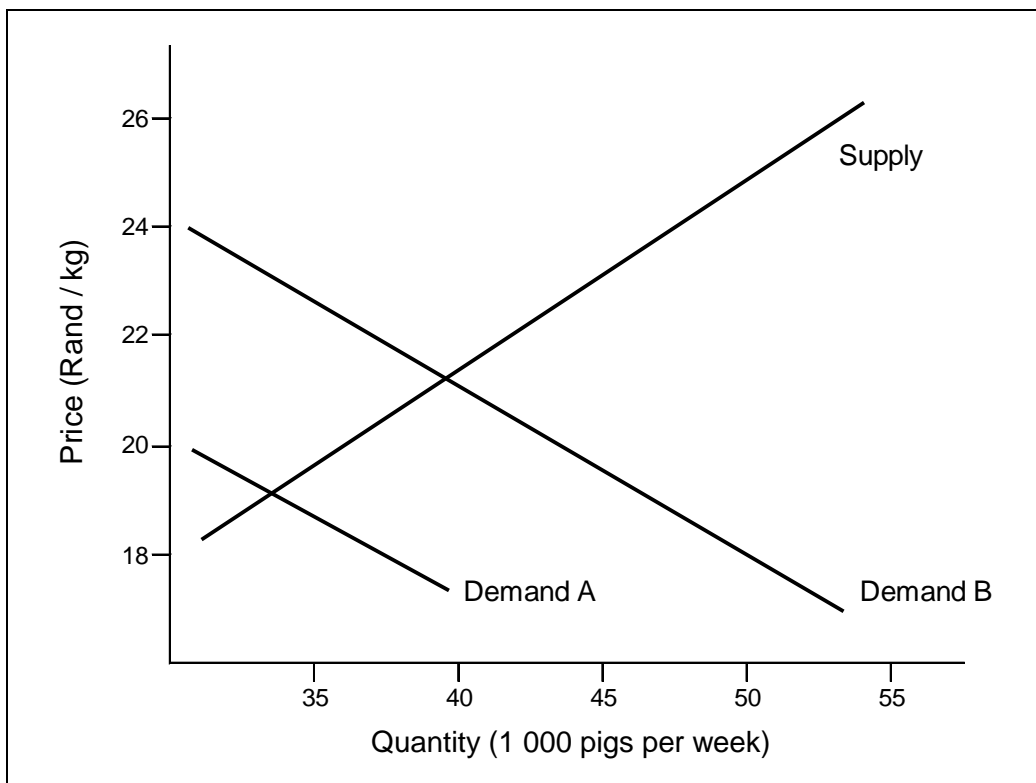
- 3.9 From the photograph above, identify FOUR factors in the dairy parlour that will require management. (4)
- 3.10 Give THREE strategies the farmer could use to make the labour on the farm more productive. (3)
- 3.11 Give FOUR things that a potential dairy farmer would need to include in a business plan of a new dairy business. (4)
- [50]**

QUESTION 4

Start this question on a NEW page.

A farmer has a 200-sow piggery in Gauteng. The recent Listeriosis outbreak has had a significant impact on the farming operation. Consumer confidence in pork as a healthy, safe product has decreased significantly as a result of the polony scare.

The figure below shows the change in the supply and demand for pork before and after the Listeriosis outbreak for the country as a whole.



- 4.1 Which demand line indicates the demand for pork before the Listeriosis outbreak. Give a reason for your answer. (2)
- 4.2 4.2.1 Give TWO management strategies that a farmer could implement to help deal with the impact of Listeriosis on the business. (2)
- 4.2.2 Give a brief explanation for each of the choices made in Question 4.2.1. (2)

The farmer has excellent managerial skills and keeps meticulous records. Below is a cash flow statement for the farm showing the average monthly income and expenses over the last year. The farmer markets the baconers at an average carcass mass of 85 kg, and on average the farm produces 320 baconers per month.

	Income	
Pig sales		R652 800
Slurry sales		R26 000
		A
	Expenses	
Labour		R48 000
Feed costs		R472 800
Water & electricity		R15 000
Medication & Vet		R12 700
Repairs & maintenance		R15 000
Replacement females		R23 450
Semen & AI		R8 635
Sundry expenses		R2 500
		B
Net Cash flow		C

- 4.3 Calculate the missing values A, B and C. Show your workings. (5)
- 4.4 What is the average pig price per kg for the year? Show your workings. (3)
- 4.5 At the equilibrium of the demand line B on the supply and demand curve on the previous page, would the farmer still make a profit? Show all your workings to support your answer. (5)

The farmer has been using the Pig Improvement Company (PIC) for several years, buying all the replacement females and semen from them. The farmer is using a commercial sow line, the Camborough 22, and a terminal sire line, the PIC 410. The farmer is basing his selection on a positive total born and weaning index. This will hopefully translate into every sow producing many heavier weaners each time she farrows.

- 4.6 Explain the difference between a commercial herd and a stud herd. (4)
- 4.7 4.7.1 What is meant by the term terminal sire? (2)
- 4.7.2 Which genetic principle is being used here to help improve production? (1)
- 4.8 4.8.1 What is a selection index? (2)
- 4.8.2 How would one calculate an index? (4)
- 4.8.3 Why would a farmer want to use an index to select animals? (2)

For pigs to grow optimally they need to be kept healthy. This is done on the farm through biosecurity measures and regular health checks of all the animals on the farm. With the pigs being sent to market at 23 weeks of age, the farmer and staff in the piggery need to pay careful attention to the drugs used in the piggery at the various stages of growth.

- 4.9 Give FOUR reasons why one should always read the label before administering a drug to an animal. (4)
- 4.10 4.10.1 What is a withdrawal period? (1)
- 4.10.2 Why is the withdrawal period important? (2)
- 4.11 Give FIVE practices that a farmer could implement to improve biosecurity on the farm. (5)
- 4.12 Identify one internal and one external parasite of pigs and indicate how you would best control each of these. (4)

[50]**QUESTION 5**

Start this question on a NEW page.

A farmer is producing cut flowers. The farmer is using cuttings to produce the flowering plants. This ensures the colour and size of the flowers. In the past the farmer grew plants from seed. This however produced flowers of varying sizes and colour. The colours produced were red, pink and white, while the sizes varied from large to small, with the majority (25%) being medium sized.

After doing some research the farmer discovered that the size of blooms or flowers is coded for by two loci while the colour is coded for by a single locus.

- 5.1 What is a locus? (2)
- 5.2 Would flower size be a qualitative or a quantitative trait? Explain your answer. (3)
- 5.3 With the aid of a Punnet square, determine the percentage of the blooms that would be large, if seeds from a cross between two medium sized flowers were to be used to produce the plant material. Use the following parent genotypes: LiSS × LiSS. (16)
- 5.4 What genetic interaction is taking place in the flower colour? Give a reason for your answer. (3)
- 5.5 What would the phenotypic ratio of the bloom colours be in plants produced by seed when crossing a red and white flower? (2)

5.6 5.6.1 List THREE ways in which pollination can take place in plants. (3)

5.6.2 If the cut flower farmer wanted to produce seed, which pollination methods listed in Question 5.6.1 above would need to be prevented? Give a reason for your answer. (4)

The farmer has discovered over time that the florists only want either tiny blooms or massive blooms. The medium sized blooms do not sell well.

The farmer has managed to develop a tiny and massive line of both the red and white blooms, but they are battling to get the same lines in the pink blooms.

5.7 Using basic genetic principles, explain why the farmer would struggle to produce the massive blooms or the tiny blooms in pink. (4)

5.8 If the market were to suddenly demand medium sized red blooms, how difficult would it be for the farmer to produce these? Explain your answer. (3)

5.9 According to the florist, the pink blooms are usually purchased by the local housewives, the red blooms by the husbands or boyfriends and the white flowers are usually purchased either for weddings or funerals.

The price achieved by the farmer for the flowers can be broken down as follows:

	Large	Medium	Small
Red	R4,50	R2,50	R0,08
Pink	R5,50	R3,50	R1,20
White	R5,00	R3,00	R1,00

To simplify the management on the farm the farmer would like to focus on fewer lines. Which lines would you recommend they drop? Explain your answer. (5)

5.10 The farmer's daughter attends a local girl's high school and would like to start a small business supplying girls and parents of the school with flowers. She plans to run the business on a pre-paid order basis, where flowers ordered during the week are delivered to school the following Monday morning.

List FIVE important entrepreneurial traits this student should possess to make the business a success. (5)
[50]

200 marks

SECTION C**QUESTION 6**

Answer the following on a new page in your ANSWER BOOK.

South Africa is currently experiencing one of the worst droughts in history. Farmers country-wide are in financial ruin and in certain parts of the country there is no sight of immediate relief.

Mrs Mahvethu farms with maize under dryland conditions in North-West Province. Discuss how she can cope better with the adverse weather conditions.

In your answer you must include:

- Conservation agriculture
- Precision farming
- Integrated farming systems
- Economics

20 marks

Total: 300 marks