AGRICULTURAL SCIENCES P1

NOVEMBER 2010

MARKS: 150

TIME: 2½ hours

This question paper consists of 19 pages and 1 answer sheet.
INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.

2. SECTION A (QUESTION 1) must be answered on the attached ANSWER SHEET.

3. SECTION B (QUESTIONS 2 to 4) must be answered in the ANSWER BOOK.

4. Start EACH question from SECTION B on a NEW page.

5. Read ALL the questions carefully and answer only what is asked.

6. Number the answers correctly according to the numbering system used in this question paper.

7. Place your ANSWER SHEET for SECTION A (QUESTION 1) inside your ANSWER BOOK.

8. Non-programmable calculators may be used.

9. Write neatly and legibly.
SECTION A

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 allocated if more than one cross (X) appears for an answer.

Example:

1.1.1 The diagram below illustrates the alimentary canal of a pig. The part of the alimentary canal labelled … is most suited for absorption.

1.1.11

A B C D

1.1.2 The following animal feed could replace more than 60% of the feed intake of a sheep:

A Maize meal
B Carcass meal
C Lucerne hay
D Groundnut oilcake meal

A E
B C
C B
D A
1.1.3 The ingredient to be included in a winter lick to regulate the intake quantities by the ruminant animals is …

A bone meal.
B maize meal.
C fish meal.
D salt.

1.1.4 The digestibility of hay is also influenced by the age of the plant. Lucerne hay cut … will have the lowest digestibility.

A after the flowering stage
B during the full flowering stage
C during the beginning of the flowering stage
D before the flowering stage

1.1.5 One of the following methods of handling farm animals applies specifically to sheep:

A Working with animals using a neck clamp
B Sudden movement from behind
C Catching the animal as high as possible on a hind leg
D Throwing stones to direct the animals

1.1.6 The permanent intensive chicken housing system made of materials that are easy to clean, where the floor of the shed is covered by straw, sawdust or wood shavings is called a …

A free-range system.
B deep litter.
C close-range system.
D battery system.

1.1.7 Many farming enterprises could be described as intensive production enterprises. The following is NOT a characteristic of an intensive production enterprise:

A A relatively small piece of land is used for the enterprise
B Large sums of capital are invested in this enterprise
C Lots of labour is utilised in such an enterprise
D Enterprises that cover a vast area of land
1.1.8 In Africa cattle have traditionally always been acknowledged for their value in a community. Identify ONE of the following statements that does NOT fit with the others:

A Cattle add nutritional and commercial value through the meat, hide and milk that they produce.
B Cattle are used for ceremonial purposes like awards for weddings and lobola.
C Cattle are used for work purposes to prepare and cultivate land.
D Cattle are only seen as holy animals which should be worshipped.

1.1.9 A long muscular tube extending from the bladder to the tip of the penis of the bull is called the …

A vas deferens.
B epididymis.
C urethra.
D sigmoid flexure.

1.1.10 The life cycle of the single-host tick follows the following pattern of metamorphosis:

A Adult→eggs→nymphs→larvae
B Adult→nymphs→eggs→larvae
C Adult→eggs→larvae→nymphs
D Adult→larvae→eggs→nymphs (10 x 2) (20)
1.2 In the table below a description and TWO possible answers are given. Decide whether the description in COLUMN B relates to A only, B only, both A and B or NONE of the answers in COLUMN A and make a cross (X) in the block (A – D) next to the question number (1.2.1 – 1.2.5) on the attached ANSWER SHEET.

Example:

<table>
<thead>
<tr>
<th>COLUMN A</th>
<th>COLUMN B</th>
</tr>
</thead>
<tbody>
<tr>
<td>A: Heartwater</td>
<td>A tick-borne disease transmitted by the blue tick</td>
</tr>
<tr>
<td>B: Redwater</td>
<td></td>
</tr>
</tbody>
</table>

Answer: The statement refers to:

<table>
<thead>
<tr>
<th>Only A</th>
<th>Only B</th>
<th>A and B</th>
<th>None</th>
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<tr>
<td></td>
<td></td>
<td></td>
<td>B</td>
</tr>
</tbody>
</table>

1.2.1 A: biuret
B: urea

A substance which is added to a ration to supplement the protein component of the feed

1.2.2 A: metabolic rate
B: digestible rate

The speed at which chemical reactions occur inside the body of an animal to release energy

1.2.3 A: oogenesis
B: spermatogenesis

The formation of female sex cells

1.2.4 A: dioestrus
B: oestrus

The period of the oestrus cycle during which the progesterone hormone is secreted

1.2.5 A: scabies
B: mange

The condition caused by an external parasite like the mite which is a proclaimed disease

(5 x 2) (10)
1.3 Give ONE word/term for each of the following descriptions. Write only the word/term next to the question number (1.3.1 – 1.3.5) on the attached ANSWER SHEET.

1.3.1 The structure in the fowl which is a common opening for the digestive and urogenital systems

1.3.2 The energy value of a feed which represents the gross energy value minus the energy that is lost in the manure, urine, gases and through body heat

1.3.3 A restricted area where a large number of animals are kept for optimal production purposes

1.3.4 The type of micro-organism that causes foot-and-mouth disease in cattle

1.3.5 The insect that attacks the wet tail areas of sheep where eggs are laid and larvae breed out and cause severe damage to the skin

1.4 Change the UNDERLINED WORD(S) in each of the following statements to make them TRUE. Write the appropriate word(s) next to the question number (1.4.1 – 1.4.5) on the attached ANSWER SHEET.

1.4.1 Passive absorption takes place from a low concentration of molecules to a higher concentration and ATP supplies energy for this process.

1.4.2 Farm animals need a maximum environmental temperature to produce at the most cost effective levels with environmental control.

1.4.3 The structure erected at the entrance of a broiler unit to disinfect the feet of the workers, is called a spray dip.

1.4.4 The permanent removal of horn buds is done with the aid of a burdizzo.

1.4.5 Branding of lambs before they develop into ewes makes mating easier.

TOTAL SECTION A: 45
SECTION B

Start this question on a NEW page.

QUESTION 2: ANIMAL NUTRITION

2.1 The diagrams below indicate the alimentary canals of farm animals.

![Diagram 1](image1.png)  ![Diagram 2](image2.png)  ![Diagram 3](image3.png)

**2.1.1** Evaluate DIAGRAM 3 and indicate why this animal would be classified as a ruminant.  

**2.1.2** Identify the diagram above that has an organ in the alimentary canal that normally has small stones that are used for grinding food particles.  

**2.1.3** Name TWO types of micro-organisms that are found in the stomach areas of the ruminant animal (DIAGRAM 3).  

**2.1.4** State TWO conditions that exist in the stomach that provide the ideal living conditions for the micro-organisms in the stomach of this ruminant animal in DIAGRAM 3.  

**2.1.5** A ruminant animal underwent a change in its nutrition after being marketed to a feedlot. The rations of the animals were changed from a roughage percentage of 60% to a roughage percentage of 40%.

Describe THREE possible changes in the digestion process because of this change in the rations to increase the production output.
2.2 The diagram below depicts a sow with a litter of piglets that needs balanced nutrition to grow. The sow is housed in a furrowing pen that has a cement floor. To meet the nutritional requirements of the piglets, the farmer made provision for the different types of feeds and supplements as follows: oilseed meals, cereal grains, vitamins A, B complex, D and E and calcium (Ca), phosphorus (P) and trace elements or micro-elements.

2.2.1 Recommend an important trace or micro-element for the piglets that may be deficient in the pen that has a cement floor. (1)

2.2.2 Name the metabolic disease that is associated with deficient levels of the element mentioned in QUESTION 2.2.1. (1)

2.2.3 State the cheapest and easiest method of supplementing the element mentioned in QUESTION 2.2.1. (1)

2.2.4 Name TWO functions of the element mentioned in QUESTION 2.2.1 in the animal body. (2)

2.2.5 Feeds for farm animals can be grouped as sources of nutritional components. Name ONE nutritional component that is not indicated in the schematic representation above. (1)
2.2.6 Choose the relevant feed, vitamin or mineral that is associated with the following descriptions from the given list provided in the schematic representation.

For example:

**QUESTION:** Feed that supplies energy to the piglets and the sow  

**ANSWER:** Cereal grains  

(a) Production of more milk for the suckling piglets  

(b) A vitamin supplement to prevent rickets during the growth of the piglets  

(c) Prevention of night blindness of the piglets and the sow  

(d) Feed which could be transformed into glycogen for the storage of energy in the animal body

2.3 During a digestibility trial with maize consumed by a pig, 49 kg of maize was consumed and 12 kg of manure was excreted. The results are indicated in the table below.

<table>
<thead>
<tr>
<th>COMPONENTS MEASURED</th>
<th>DRY MATERIAL</th>
<th>CRUDE PROTEIN</th>
<th>CRUDE FIBRE</th>
<th>NITROGEN-FREE EXTRACT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>40,33 kg</td>
<td>4,80 kg</td>
<td>0,94 kg</td>
<td>34,32 kg</td>
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<tr>
<td>Droppings</td>
<td>4,6 kg</td>
<td>0,86 kg</td>
<td>0,62 kg</td>
<td>2,11 kg</td>
</tr>
<tr>
<td>Amount digested</td>
<td>37,73 kg</td>
<td>3,94 kg</td>
<td>0,32 kg</td>
<td>32,21 kg</td>
</tr>
<tr>
<td>Digestibility</td>
<td>89%</td>
<td>82,08%</td>
<td>34,4%</td>
<td>93,85%</td>
</tr>
</tbody>
</table>

2.3.1 Calculate the moisture content of the manure or droppings as a percentage. (Show ALL the calculations.)

2.3.2 The feed that was investigated in the above experiment was a concentrate. Give TWO reasons from the data in the table above to support this statement.

2.3.3 Name the TWO components of a feed that are represented by the nitrogen-free extract.

2.3.4 State THREE methods to improve the digestibility of maize as a grain feed.
2.4 You have been approached by a group of farmers who want to feed their lactating ewes some concentrate feed in addition to their normal grazing. The farmers say they can buy some maize and sunflower oilcake meal cheaply. You do some research and find out that maize has a crude protein content of 10.6% and sunflower oilcake meal has a crude protein content of 40%. These lactating ewes require 13.4% crude protein in their concentrate.

2.4.1 Use the Pearson-square method to calculate the ratio in which maize and sunflower oilcake meal should be mixed to get to the required crude protein value for these lactating ewes. (4)

2.4.2 Choose the production status of these ewes from the options below that requires them to have a relatively higher protein requirement:

- Lamb ewes
- Dry ewes
- Pregnant ewes
- Lactating ewes (1)

[35]
Start this question on a NEW page.

QUESTION 3: ANIMAL PRODUCTION

3.1 A young rural farmer has limited funds and a grazing area next to a neighbour's orchard and planted vegetable garden. Initially the farmer used a pen with a chain to tie goats down, as indicated in DIAGRAM A. The young farmer was later advised by the grandparent to use a running tether as illustrated in DIAGRAM B.

3.1.1 Give TWO possible reasons why this young farmer limited the movement of these goats.

3.1.2 Compare the effective use of pastures according to the method used in DIAGRAM A and the method used in DIAGRAM B.

3.1.3 Name ONE alternative method of controlling the movement of goats during grazing that is not illustrated above.
3.2 The illustration below represents a handling facility for cattle.

3.2.1 State TWO factors that should be considered when designing and building a handling facility like the one in the above diagram. (2)

3.2.2 Give TWO reasons why it is important to have a crush in a handling facility. (2)

3.2.3 Describe FOUR basic principles that need to be implemented when handling cattle in a facility like the one indicated above. (4)

3.2.4 State TWO consequences or implications of not following the basic principles mentioned in QUESTION 3.2.3. (2)
3.3 The following pictures illustrate two production systems. PICTURE A shows a sheep farming enterprise in the Karoo and PICTURE B shows a farmer working in a layer unit.

3.3.1 Identify whether PICTURES A and B above represent intensive or extensive production systems.

3.3.2 Tabulate TWO differences between the production systems mentioned in QUESTION 3.3.1.

3.3.3 Name a farming enterprise, related to the pictures above, which has the highest risk factor with regard to climate. Justify your answer.
3.4 The picture below represents some actions in the production process on a stock farm.

Use the picture above and indicate the letter (A – F) that represents the actions that are used in this animal production enterprise with regard to the following:

3.4.1 Storage of feeds (1)
3.4.2 Animal populations (1)
3.4.3 Planted pastures (1)
3.4.4 Water provision (1)
3.5 The farmer in the picture below has measured the milk yield of each dairy cow in the herd. The table on the right gives the average yield per cow measured on a monthly basis over the lactation period of 9 months.

<table>
<thead>
<tr>
<th>TIME (MONTH)</th>
<th>MILK YIELD (kg)</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>600</td>
</tr>
<tr>
<td>2</td>
<td>650</td>
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<td>8</td>
<td>480</td>
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<td>9</td>
<td>460</td>
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</table>

3.5.1 Draw a line graph to represent the average monthly yield of these dairy cows over the 9 month lactation period. (4)

3.5.2 Name the instrument used by this dairy farmer to measure the quantities of milk. (1)

3.5.3 Calculate the total monthly average milk production over a lactation period of 9 months, as indicated in the table. (3)
Start this question on a NEW page.

QUESTION 4: ANIMAL REPRODUCTION, PROTECTION AND CONTROL

4.1 The diagram below illustrates a process that occurs during reproduction.

4.1.1 Name the process that takes place between parts A and B. (1)

4.1.2 Label parts A to D. (4)

4.1.3 Name the type of twins which develops in the diagram above. (1)

4.2 The diagrams below indicate morphological abnormalities of structures that play an important role in normal animal reproduction.

4.2.1 Identify the part labelled 2 in structure A above. (1)
4.2.2 Select the normal structure of a sperm cell from A to H.

4.2.3 Name the section of the sperm that would be responsible for the following:

(a) Movement

(b) Carrier of genetic information

4.2.4 Name the organ where the structures illustrated on the previous page are formed.

4.3 The graph below represents the annual reproductive aspects in the life of a dairy cow.

4.3.1 List THREE activities that occur in the first two months after calving in the life of this cow.

4.3.2 Identify the month (indicated as 1 to 12) when this cow will be inseminated.

4.3.3 Name the TWO months when the calf foetus will grow at the fastest rate.
4.3.4 Indicate the length of the following processes in months:

(a) Duration of the pregnancy period (1)

(b) Duration of the lactation period (1)

(c) Duration of the dry period (1)

4.3.5 Determine the approximate weight of the foetus at month 10. (1)

4.4 Name FOUR bacterial diseases that affect production in livestock. (4)

4.5 The figure below indicates the seasonal trends in the occurrence of parasites that vary with regard to season and management.

4.5.1 Name the season with the highest parasite pressure (infestation). (1)

4.5.2 Give a reason for the high parasite pressure (infestation) during the season mentioned in QUESTION 4.5.1. (1)

4.5.3 State TWO good herd management practices that may lead to less parasite pressure (infestation). (2)

4.5.4 Suggest a way of diagnosing parasite infestations. (1)

4.5.5 State THREE economic impacts of internal parasites. (3)

4.5.6 Identify TWO biological control measures of internal parasites. (2)

TOTAL SECTION B: 105
GRAND TOTAL: 150
SECTION A

CENTRE NUMBER: 

EXAMINATION NUMBER: 

QUESTION 1.1

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(10 x 2) (20)

QUESTION 1.2

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(5 x 2) (10)

QUESTION 1.3

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(5 x 2) (10)

QUESTION 1.4

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(5 x 1) (5)

TOTAL SECTION A: 45
SECTION A

QUESTION 1.1

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(10 x 2) (20)

QUESTION 1.2

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(5 x 2) (10)

QUESTION 1.3

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(5 x 2) (10)

QUESTION 1.4

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<td>1.4.2</td>
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</tr>
<tr>
<td>1.4.3</td>
<td>Foot bath / Step dip / Foot dip</td>
<td></td>
</tr>
<tr>
<td>1.4.4</td>
<td>Dehorning iron / Dehorning spoon / Dehorner / Dehorning paste</td>
<td></td>
</tr>
<tr>
<td>1.4.5</td>
<td>Docking / Removal of tail / Crouching</td>
<td></td>
</tr>
</tbody>
</table>

(5 x 1) (5)

TOTAL SECTION A: 45
SECTION B

QUESTION 2: ANIMAL NUTRITION

2.1 Diagrams of the alimentary canals of farm animals

2.1.1 Four different compartments visible in stomach area / complex stomach
Has a large compartment in stomach area / fermentation vessel / rumen
Very long small intestine
Very large / enlarged caecum

2.1.2 Diagram 1

2.1.3 Protozoa
Bacteria

2.1.4 Anaerobic environment / oxygen-free environment
Warm environment
Wet environment
Suitable pH value
Sufficient nutrients / regular intake of feed
Easily digestible carbohydrates
Sufficient mineral nutrients
Sufficient nitrogen
Mechanism for removal of waste products / excretion

2.1.5 Changes in the composition of the micro-organisms
Changes in the type of fatty acids that are formed
Changes in the quantity and type of gasses which are formed
Changes in pH of the stomach content
Changes in the rate of digestion

2.2 The diagram of the sow and the litter of piglets

2.2.1 The trace element that is deficient in the pen with concrete floor
   • Iron/Fe

2.2.2 Metabolic disease associated with iron/Fe deficiency
   • Anaemia

2.2.3 Cheapest and easiest method of supplementing Iron /Fe.
   • Soil sods/dosing/injecting
2.2.4 Two functions of the iron/Fe in animal production
- The formation of haemoglobin in the red blood corpuscles / prevents anaemia √
- Formation of the enzymes involved in oxygen transport √
- Forms a part of compounds which serve as iron reserves in the body √
- Activates various enzymes in the body √ (Any 2) (2)

2.2.5 The type of feed that was not indicated on the diagram
- Fats / oils / lipids √
- Water √ (Any 1) (1)

2.2.6 Food types associated with the descriptions
(a) Oilseed meals √
(b) Vitamin D √
(c) Vitamin A √
(d) Cereal grains √ (4)

2.3 Experiment on digestibility co-efficiency
2.3.1 12 kg – 4,6 kg = 7,4 kg √

\[ \frac{4.6}{12} \times 100 \] √

OR

\[ \frac{7.4}{12} \times 100 \] √

38,3% DM √

= 61,7% √

100% – 38,3% = 61,7% √ (3)

2.3.2 The feed was maize which is an example of a concentrate √
Very high digestible coefficient values / High TDN value √
Low in crude fibre / Crude fibre of 0,94 kg √
High in carbohydrates / Nitrogen-free extract / High in energy √ (Any 2) (2)

2.3.3 Carbohydrates / sugars / starches √
Lipids / Fats/ Oils √ (2)

2.3.4 Ways to improve the digestibility:
- Feed mixtures √
- Nitrogen supplements / Urea / Biuret √
- Soaking √
- Boiling √
- Pelleting √
- Roasting √
- Cracking / Rolling / crushing √
- Grinding / Milling √
- Radiation √ (Any 3) (3)
2.4 Square method to determine the mixture in the ration

2.4.1 Maize 10.6\% 26.6 parts \[ \sqrt{ } \]
Sunflower oilcake meal 40\% 2.8 parts \[ \sqrt{ } \]

Ratio: Maize : Sunflower oilcake meal = 26.6 : 2.8 \[ \sqrt{ } \]
OR
Mix 26.6 parts of maize with 2.8 parts of sunflower oilcake meal \( \sqrt{ } \) (4)

2.4.2 Lactating ewes \( \sqrt{ } \) (1) [35]

QUESTION 3: ANIMAL PRODUCTION

3.1 Handling facility for goats

3.1.1 To utilise the available grazing more effectively/rotational grazing \( \sqrt{ } \)
Other crop damage/damage to vegetables/damage to orchard \( \sqrt{ } \)
Security reasons/keep animals close to homestead \( \sqrt{ } \) (Any 2) (2)

3.1.2 DIAGRAM A:
Grazing areas not utilised effectively/circular grazing area \( \sqrt{ } \)
Animals have a smaller area to move in \( \sqrt{ } \) (Any 1)

DIAGRAM B:
Grazing area utilised more effectively/square grazing area \( \sqrt{ } \)
Animals have a larger area to move in \( \sqrt{ } \) (Any 1) (2)

3.1.3 Fences/herd boy/temporary fencing/trained dogs \( \sqrt{ } \) (1)
3.2 **Handling facility for beef cattle**

3.2.1 Factors to consider when building a handling facility
- Site / Space / Type of surface ✓
- Location / Slope ✓
- Design / Farming system ✓
- Materials ✓
- Layout ✓
- Size of the herd ✓
- Breed of animal ✓
- Affordability / Economic implication ✓
- Safety ✓
- Availability of labour ✓

(Any 2) (2)

3.2.2 TWO reasons that would indicate the importance of having a crush in a handling facility:
- To ensure safety (handlers and animals) while working with large animals ✓
- To be able to work with animals while they are static/stable ✓
- To perform specialised practices on animals (AI, dehorning, castration, tattooing, branding, apply medication, physical examinations, treatments) ✓
- Time and labour efficient ✓
- Normally connected to a loading facility to load animal easier ✓

(Any 2) (2)

3.2.3 Basic principles in handling cattle:
- Keep safety as the main principle in your mind ✓
- Cattle are nervous by nature therefore they should be kept as calm as possible ✓
- Use the correct handling equipment (e.g. prober) ✓
- Stay aware of animals' nature / instinct / sight ✓
- No carrying of stick or throwing of stones ✓
- No shouting, whistling or wild gesticulations ✓
- Move around slowly and no running around ✓
- Keep animals of the same size / age together ✓
- Animals in crush must face the same direction ✓
- Separate sick / old / pregnant animals from healthy animals ✓
- Limit the number of people in a facility ✓

(Any 4) (4)

3.2.4 Impact of not following basic principles:
- Injuries to animals (stampede) ✓
- Injuries to handlers (fatal) ✓
- Damage to property ✓
- Lower quality of carcass/poor meat quality ✓
- Lactating animals will have lower production ✓
- Miscarriages or abortions in pregnant animals ✓
- Animals run away / Wild behaviour / Stress ✓

(Any 2) (2)
3.3 Production Systems

3.3.1 A: Extensive ✓
B: Intensive ✓

3.3.2 Differences between the production systems

<table>
<thead>
<tr>
<th>A: Extensive</th>
<th>B: Intensive</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Depend mainly on natural resources / not fed with well formulated feed ✓</td>
<td>• Animals are well taken care, carefully bred and closely supervised (optimal inputs and outputs) / technologically advanced systems utilised / well formulated feed ✓</td>
</tr>
<tr>
<td>• Not many capital inputs / not capital intensive ✓</td>
<td>• Capital intensive / expensive infrastructure ✓</td>
</tr>
<tr>
<td>• Normally on a large piece of land ✓</td>
<td>• Relatively small area is utilised ✓</td>
</tr>
<tr>
<td>• Not labour intensive / few labourers ✓</td>
<td>• Very labour intensive ✓</td>
</tr>
</tbody>
</table>

(Any 2) (Any 2)

3.3.3 Recommendation of a farming system
A / sheep / cattle / game / goat farming in dry area / Pasture production ✓
This farming enterprise is dependant on unpredictable climatic / environmental conditions ✓

3.4 Fodder flow programme

3.4.1 D ✓
3.4.2 B ✓
3.4.3 C ✓
3.4.4 A ✓
3.5 3.5.1  **Heading:** The average milk yield measured against time (9 months)

![Graph showing milk yield over time](image)

**Checklist to mark:**

<table>
<thead>
<tr>
<th>ITEM/Criteria</th>
<th>Evidence/No Mark</th>
<th>Evidence/Yes Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heading</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Axes labelled (both)</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Units appear (both axes)</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Correct values</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td></td>
<td>4</td>
</tr>
</tbody>
</table>

3.5.2  **Scale**  ✓

3.5.3  \[
\frac{600 + 650 + 620 + 590 + 560 + 530 + 500 + 480 + 460}{9} \]
\[= \frac{4990}{9} \]
\[= 554.4 \text{ kg/cow/month} \]  ✓

**QUESTION 4: ANIMAL REPRODUCTION, PROTECTION AND CONTROL**

4.1  **The process or events that take place during reproduction**

4.1.1  Fertilisation / fusion of gametes  ✓  

4.1.2  A – Sperm cell/spermatozoon/male reproductive cell/gamete/seed  ✓  
      B – Ovum/egg cell/female reproductive cell/gamete/ootid  ✓  
      C – Zygote/blastozyt/Zona Pellucida  ✓  
      D – Foetus/embryo/new individual/identical twins/monozygotic twins  ✓  

4.1.3  Identical twins/Monozygotic twins  ✓  

[35]
4.2 Diagrams of sperm cells

4.2.1 Middle piece/mid piece/body/neck √ (1)

4.2.2 A/B/C/E √ (1)

4.2.3 (a) tail/flagellum √ (1)
   (b) head/nucleus √ (1)

4.2.4 Testis / primary sex organ √ (1)

4.3 Graph of the reproductive aspects of dairy cow

4.3.1 Milk production (Lactation) starts / Colostrum is formed √
   Milk production increases to peak production √
   Animal needs to be well fed/Feed consumption increases √
   Recovery of reproductive organs and glands / oestrus starts again √
   Metabolic state of animal changes √ (Any 3) (3)

4.3.2 Month 2 or 3 √ (1)

4.3.3 Month 10 / 11 and √
   Month 12 √
   or
   During the last two months (7 / 8 and 9) of pregnancy √√ (2)

4.3.4 (a) 9 months √
   (b) 9 / 10 months √
   (c) 2 / 3 months √ (3)

4.3.5 4 kg – 4,5 kg √ (1)

4.4 Bacterial diseases

Vibriosis √
Botulism √
Brucellosis/Contagious abortion √
Mastitis √
Tetanus √
Paratyphoid √
Anthrax √
Calf diphtheria √
White scours √
Tuberculosis √
Pulpy kidney √
Black quarter / Black evil √
Pasteurellosis √
Cheesy gland √ (Any 4) (4)
4.5 Internal parasite pressure

4.5.1 Spring ✓

4.5.2 Poor herd management/conditions are suitable for multiplication of parasites ✓
Environmental conditions are more favourable for the breeding of pests ✓ (Any 1) (1)

4.5.3 Good herd management practices
- Good nutrition ✓
- Health programme/chemical control/biological control ✓
- Avoiding wet places ✓
- Rotational grazing ✓ (Any 2) (2)

4.5.4 Diagnosing parasite infections
- Faecal egg count ✓
- Post mortem examination/Autopsy ✓
- Inspection/observation of animals ✓
- Blood tests ✓ (Any 1) (1)

4.5.5 THREE economic importance/effects of internal parasites
- Stock losses ✓
- Loss of production/reproduction/illness ✓
- Degrading of carcasses ✓
- Danger to human health/other animals health ✓
- Increased production cost / loss of income ✓ (Any 3) (3)

4.5.6 TWO biological control measures of internal parasites
- Keep animals in good condition ✓
- Rotational grazing ✓
- Avoiding wet places ✓
- Avoid keeping animals in infested pens / Good hygienic practices ✓
- Creating an environment for natural enemies ✓
- Release fungus tea / Natural organic herbs ✓
- Using / Selecting / Breeding more resistant animals ✓
- Burning of veld or pasture fields ✓
- Sterilisation of pests / Gene modification ✓ (Any 2) (2)

[35]

TOTAL SECTION B: 105
GRAND TOTAL: 150
This question paper consists of 18 pages and 1 answer sheet.
INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.

2. SECTION A (QUESTION 1) must be answered on the attached ANSWER SHEET.

3. SECTION B (QUESTIONS 2 to 4) must be answered in the ANSWER BOOK.

4. Start EACH question from SECTION B on a NEW page.

5. Read the questions carefully and make sure you answer what is asked.

6. Number the answers correctly according to the numbering system used in this question paper.

7. Non-programmable calculators may be used.

8. Place your ANSWER SHEET for SECTION A (QUESTION 1) in your ANSWER BOOK.

9. Write neatly and legibly.
SECTION A

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 allocated if more than one cross (X) appears for an answer.

EXAMPLE:

1.1.1 The most important planning document that a farmer will use to manage his/her expenditure during the financial year is the …

A inventory of farm assets.
B soil map.
C cheque book statement.
D farm budget.

1.1.2 Farmers in a rural area of the country lost stock through theft. This had a direct influence on the … of their farming enterprises.

A risk management
B health programme
C labourers
D pasture evaluation

1.1.3 The picture below shows a farmer observing and counting a herd of cattle. This data will be inserted on a record sheet. The management principle that is illustrated reflects …

A motivation.
B coordination.
C leadership.
D control.
1.1.4 The graph below illustrates interaction between demand and supply. The effect of an increase in demand could best be described as ...

A an increase in the equilibrium price of the product.
B a decrease in the equilibrium price of the product.
C a decrease in the supply of the product.
D a decrease in the quantity of the product.

1.1.5 The economic characteristic of agricultural land which makes it a good long-term investment is its ...

A location.
B management.
C durability.
D risk.

1.1.6 The source of credit that a farmer would normally use to purchase land and to finance its improvement which includes fences, buildings and boreholes:

A Cash loan agency
B Commercial bank cheque overdraft account
C Land Bank loan
D Own capital

1.1.7 The type of capital that is regarded as permanent and durable is ...

A a tractor.
B a dam.
C the wages of farm workers.
D fuel for the tractor.
1.1.8 ONE of the following statements CANNOT be classified as an entrepreneurial ability:

A. To achieve the objectives of the enterprise
B. To keep the labourers productive and satisfied
C. To be dominant and enforce your own opinions
D. To be dynamic and adaptable to change and development

1.1.9 The hybrid Brahford (BH) cow was crossed with the homozygous Brahman (BB) bull. This crossing resulted in the genotypic ratio of … in the F₁-generation.

A. 1 : 2 : 1
B. 3 : 1
C. 75% : 25%
D. 1 : 1

1.1.10 ONE of the following is NOT a valid gene for seed colour in a pea plant:

A. Aa
B. Ab
C. Bb
D. Cc
1.2 Choose a description from COLUMN A that matches a concept/phrase in COLUMN B. Write only the letter (A – J) next to the question number (1.2.1 – 1.2.5) on the attached ANSWER SHEET, for example 1.2.6 N.

<table>
<thead>
<tr>
<th>COLUMN A</th>
<th>COLUMN B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2.1 A plan set up by the farmer to make provision for aspects like soil preparation, planting, crop care, harvesting and marketing</td>
<td>A mass selection</td>
</tr>
<tr>
<td>1.2.2 Too much money invested in relation to other production factors</td>
<td>B undercapitalisation</td>
</tr>
<tr>
<td>1.2.3 The selection of an animal based on the quality of the animal ancestors</td>
<td>C upgrading</td>
</tr>
<tr>
<td>1.2.4 The successive use of a pure-bred bull on a hybrid herd of cows with the aim of eventually building up a particular breed</td>
<td>D production plan</td>
</tr>
<tr>
<td>1.2.5 The selection that is based on the quality of its offspring</td>
<td>E overcapitalisation</td>
</tr>
</tbody>
</table>
<pre><code>                                                                                 | F business plan         |
                                                                                 | G progeny selection      |
                                                                                 | H index value            |
                                                                                 | I pedigree selection     |
                                                                                 | J atavism               |
</code></pre>

(5 x 2) (10)

1.3 Give ONE word/term for each of the following descriptions. Write only the word/term next to the question number (1.3.1 – 1.3.5) on the attached ANSWER SHEET.

1.3.1 The long-term aim of the farming business that is set up during a strategic planning session

1.3.2 The path that an agricultural product follows from the farmer to the hands of the consumer

1.3.3 The production factor that represents equipment, seed, fertilisers and chemicals used in the growing of crops

1.3.4 The change of a characteristic from one extreme to another with most of the individuals performing at the average

1.3.5 When one gene completely overshadows the effect of the other gene in connection with a heredity factor

(5 x 2) (10)
1.4 Change the UNDERLINED WORD(S) in the following to make the statements TRUE. Write the appropriate word(s) next to the question number (1.4.1 – 1.4.5) on the attached ANSWER SHEET.

1.4.1 Organising involves the checking and verification of the results of decision-making.

1.4.2 Grading is the provision of preset specifications, which will give uniformity to a group of products.

1.4.3 Movable capital refers to capital goods that are used for one production season only, for example fuel, fertiliser and feeds.

1.4.4 Casual labour is employed during peak periods, often for a specific task, such as harvesting.

1.4.5 Atavism is the ability of an individual to transmit particular characteristics to the progeny. (5 x 1)  

TOTAL SECTION A: 45
SECTION B

Start this question on a NEW page.

QUESTION 2: AGRICULTURAL MANAGEMENT

2.1 Ten subsistence farmers in a coastal province of the country are producing amadumbe (*Colocasia esculenta*) for household consumption. The edible organs are the corms that are baked, cooked or roasted. They farm individually with no definite market to sell their produce. Their production per hectare is much more than what an individual family can consume, thus resulting in oversupply. They are keen to expand their area of production and turn it into a commercial enterprise. This requires entrepreneurial and marketing skills, which they do not have.

2.1.1 A free marketing system is preferred by these farmers. Describe THREE advantages of this marketing system. (3)

2.1.2 Suggest THREE ways in which the farmers will solve their challenge of oversupply in the future. (3)

2.1.3 Name FOUR entrepreneurial skills that will be required by these farmers to ensure that their business is completely commercialised. (4)

2.2 The graph below illustrates the cotton export price trends which were directly affected by demand and supply over a period of six months.

![Cotton export trends graph]

2.2.1 Indicate the month when there was the least demand for cotton in the export market. (1)

2.2.2 Determine the approximate quantity of cotton exported in March. (1)
2.2.3 Describe the possible implication on export if the supply of cotton in May was to be higher than the demand. (2)

2.2.4 State FOUR factors that will determine the supply of cotton in the world markets. (4)

2.3 A farmer in KwaZulu-Natal plans to plant 200 ha of sugar cane in the following year and therefore keeps record of marketing trends of sugar cane. The table below summarises the results that this farmer needs in the decision-making process.

<table>
<thead>
<tr>
<th>TIME (YEARS)</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity of sugar cane supplied (million ton)</td>
<td>180</td>
<td>170</td>
<td>200</td>
<td>220</td>
</tr>
<tr>
<td>Price per ton (R/ton)</td>
<td>450</td>
<td>500</td>
<td>650</td>
<td>720</td>
</tr>
<tr>
<td>Quantity of sugar cane demanded (million ton)</td>
<td>230</td>
<td>210</td>
<td>175</td>
<td>165</td>
</tr>
</tbody>
</table>

2.3.1 Draw a line graph to indicate the changes in the price of sugar cane from 2005 to 2008. (4)

2.3.2 Indicate the TWO factors that will possibly influence the price of sugar cane over a period of time by using the data which is supplied above. (2)

2.3.3 With reference to the data supplied for 2008, it is not recommended that this farmer continues with sugar cane farming. Justify this statement by giving a reason. (2)
2.4 The tables below represent the financial statements of two farmers involved in egg production.

**FARMER A:**

<table>
<thead>
<tr>
<th>EXPENDITURE ITEMS/EXPENSES (RANDS)</th>
<th>INCOME (RANDS)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost price of layers</td>
<td>13 500</td>
<td>Eggs</td>
</tr>
<tr>
<td>Feed</td>
<td>9 500</td>
<td>Sales of layers</td>
</tr>
<tr>
<td>Electricity, water and wages</td>
<td>6 000</td>
<td>Sale of manure</td>
</tr>
<tr>
<td>Gas for heating</td>
<td>400</td>
<td>Profit</td>
</tr>
<tr>
<td>Egg trays</td>
<td>2 100</td>
<td></td>
</tr>
<tr>
<td>Veterinary care</td>
<td>1 200</td>
<td></td>
</tr>
<tr>
<td>Maintenance</td>
<td>800</td>
<td></td>
</tr>
</tbody>
</table>

**Total:**

**FARMER B:**

<table>
<thead>
<tr>
<th>EXPENDITURE ITEMS/EXPENSES (RANDS)</th>
<th>INCOME (RANDS)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost price of layers</td>
<td>13 500</td>
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<td></td>
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</tr>
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<td>Egg trays</td>
<td>2 100</td>
<td></td>
</tr>
<tr>
<td>Veterinary care</td>
<td>1 200</td>
<td></td>
</tr>
<tr>
<td>Maintenance</td>
<td>800</td>
<td></td>
</tr>
</tbody>
</table>

**Total:**

2.4.1 Calculate the net profit of FARMERS A and B.

2.4.2 Identify the most successful farmer based on your calculation in QUESTION 2.4.1. Give a reason to support your answer.

2.4.3 Describe THREE components of a cash-flow budget as it is represented in the data above.
QUESTION 3: PRODUCTION FACTORS AND MANAGEMENT

3.1 Agricultural management can be defined as a comprehensive activity, involving the combination and coordination of human, physical and financial resources. These factors are combined in a way which produces a commodity or a service which is both wanted and can be offered at a price which will be paid. This process also includes making the working environment for those involved agreeable and acceptable.

3.1.1 Identify FOUR main factors that need to be combined in the management of a farm.

3.1.2 Indicate the management principle (function) that will ensure that objectives are pursued.

3.1.3 State TWO external influences that may affect the farm as a business.

3.1.4 The picture below represents land as a physical resource that is utilised in agricultural management. Briefly describe THREE economical characteristics of land.

3.2 Last year 260 of Leliefontein Farm Estate's farm workers, who have lived on the Bosmans' farm for eight generations, became shareholders of several entities, paid for by the government's land reform programme.

The workers qualified for grants totalling R29 million and they used R22.3 million to buy a 50% stake in the companies of the best wine lands in the Cape.

Through the launch of the farm worker equity scheme in October 2008, these workers have attended several training courses in management, team building and financial skills offered by AgriBEE.

[Adapted from: Farmers' Weekly, 2009/10/23]
3.2.1 Identify a scheme that was launched in October 2008.

3.2.2 Name TWO ways in which this scheme has benefited the farm workers.

3.2.3 Name a labour challenge that has been addressed through this scheme.

3.2.4 Name an Act that corresponds to your response in QUESTION 3.2.3.

3.2.5 Farming is a business and to manage it successfully, several skills are needed. State TWO such skills that the Leliefontein farm workers have been empowered with.

3.2.6 Identify labour legislation associated with the rights and responsibilities of farm labourers.

3.2.7 Indicate the type of labourers that are working on the Leliefontein Farm Estate. Justify your answer.

3.3 The advertisement below appeared in a newspaper under the heading: Vacancies/Employment Offered.

Farm manager and farm worker required for a progressive poultry breeding farm and hatchery (two vacant positions). Apply by sending a CV to the owner at the e-mail address indicated below. Competitive salaries and other benefits are offered.
PBFHfarms@chicken.co.za

The owner then compiled the following brief summaries of the CVs from applicants:

<table>
<thead>
<tr>
<th>CANDIDATE A</th>
<th>CANDIDATE B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer literate, experience in export marketing, financial experience and has been a greenhouse manager. Hard-working, self-motivated with good organisational skills. Agricultural degree in financial and business planning.</td>
<td>10 years' experience working with sheep, cattle, horses, poultry and maize on different farms. Tractor operator and completed a basic course on maintenance of farm equipment.</td>
</tr>
</tbody>
</table>
3.3.1 A panel was appointed to interview the candidates for each position. The following grid was provided to evaluate all the candidates that were selected for the interview. Evaluate EACH of the candidates mentioned above using the following grid:

Adopt the following rating: 3 = good; 2 = fair; 1 = weak

<table>
<thead>
<tr>
<th>CANDIDATES</th>
<th>QUALIFICATIONS LEVEL</th>
<th>MANAGEMENT SKILLS</th>
<th>TECHNICAL SKILLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Candidate A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Candidate B</td>
<td></td>
<td></td>
<td></td>
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</table>

(6)

3.3.2 Identify a candidate from the evaluation in QUESTION 3.3.1 that would be most suitable for each of the following positions on the farm and motivate your choice in each case:

(a) Farm manager (2)

(b) Farm worker (2)

3.3.3 Identify a candidate from the candidates indicated as A and B in QUESTION 3.3.1 that would NOT be suitable to work in the workshop on the farm. (1)
3.4 The diagram below represents products and capital items in agriculture.

3.4.1 Identify the problem with regard to capital that the farmer faces when using a loan. (1)

3.4.2 Identify the appropriate capital items (labelled A – G) from the diagram above that is best described by the following statements:

(a) The letter that represents a fixed capital item (1)
(b) The letter that represents a movable capital item (1)

3.4.3 Give a reason why risk is possibly reduced when producing product E on the farm. (1) [35]
QUESTION 4: BASIC AGRICULTURAL GENETICS

4.1 The plant breeder conducted research work with two Bt maize cultivars to determine the lysine content of the seeds in the F₁-generation. The gene (A) for high lysine is dominant over the recessive gene (a) for low lysine content. The Bt maize cultivar with heterozygous high lysine content (Aa) was cross-pollinated with the Bt maize cultivar that had a low lysine content (aa) and the F₁-generation had 50% maize seeds with low lysine content.

4.1.1 Use the Punnett square to show the crossings of the two cultivars. (4)

4.1.2 Define the following genetic terms:
   (a) Genotype (2)
   (b) Recessive gene (2)

4.1.3 Apart from the lysine content mentioned above, name TWO other characteristics of genetically modified maize that would support them to survive in a particular environment. (2)

4.2 The Bapedi are people of the Limpopo Province residing in the areas around Polokwane. Traditional livestock, especially cattle, are still valued for their fertility and productivity by these people.

Traditional Bapedi breeding is done between cattle-owning households (neighbours, friends or relatives) to increase the fertility and production of the herd. Milk and meat production are increased by driving the cattle to places of fodder that is believed to increase the fertility of the stock.

Cattle diseases such as nyoko (gall sickness) and letšhollo (diarrhoea) that cause poor production and even deaths are controlled locally and traditional plant medicine is applied for preventative and remedial purposes.

4.2.1 Indicate whether the basic types of breeding methods used are inbreeding or cross-breeding. Give a reason for your answer. (2)

4.2.2 Identify the type of medicine used to treat cattle diseases by the Bapedi people. (1)

4.2.3 Explain why the traditionally bred cattle are still valued. (1)

4.2.4 Briefly explain how fertility is maintained among cattle that are kept by the Bapedi people mentioned in the paragraph above. (2)
4.3 Variation is a phenomenon that causes the offspring to be slightly different from their parents.

4.3.1 Indicate the TWO internal causes of variation.  

4.3.2 Explain TWO important roles of genetic variation in a breeding programme.  

4.4 Pure-bred Shorthorn cattle may be either red or white. The red colour is the dominant characteristic but when they are crossed, their hybrid offspring are neither red nor white. They are roan, which is a combination of red and white and represents incomplete dominance.

4.4.1 R is used to represent the genotype for red colour. Indicate the letter that you would use for the white colour. Motivate your answer.  

4.4.2 Determine the genotype for roan cattle. Explain your answer.  

4.4.3 Draw a schematic representation of the crossing between a homozygotic red Shorthorn bull and a white Shorthorn cow to predict the possible phenotypes and genotypes of the offspring.
4.5 The cartoon below summarises the process to develop a GMO crop.

1. Genetic modification introduces characteristics from one living thing into another. But how is it done? … and why?

2. Resurrection plant

3. A gene is a section of DNA, which carries information about a particular characteristic.

4. Resurrection DNA

5. Maize DNA
4.5.1 Briefly outline the process followed in the technique to develop a GMO cultivar as illustrated in the cartoon. (3)

4.5.2 Name TWO possible benefits of GMO maize cultivars for commercial agriculture. (2)

TOTAL SECTION B: 105
GRAND TOTAL: 150
SECTION A

QUESTION 1.1

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QUESTION 1.2

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QUESTION 1.3

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(5 x 2) (10)

QUESTION 1.4

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TOTAL SECTION A: 45
This memorandum consists of 11 pages.
SECTION A

QUESTION 1.1

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QUESTION 1.2

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(5 x 2) (10)

QUESTION 1.3

1.3.1 Vision ✓✓
1.3.2 Marketing chain or channels/Supply chain/Demand chain/Agri-business Chain/Distribution chain ✓✓
1.3.3 Capital ✓✓
1.3.4 Variation/Continious variation ✓✓
1.3.5 Dominance ✓✓

(5 x 2) (10)

QUESTION 1.4

1.4.1 Control / Monitoring / Supervision ✓
1.4.2 Standardisation ✓
1.4.3 Floating capital /Working capital/ Production capital/Trading capital ✓
1.4.4 Seasonal /Temporary / Part time ✓
1.4.5 Prepotency ✓

TOTAL SECTION A: 45
SECTION B

QUESTION 2

2.1 Marketing system for amadumbe

2.1.1 THREE advantages of free marketing system
• Producers sell where they please ✓
• Consumers buy where they please ✓
• Consumers buy when they please ✓
• Producers sell when they please ✓
• Producers can sell at their own price ✓
• Consumers can buy bargains ✓
• Sales are usually for immediate cash ✓
• There is usually very little delay in payment ✓
• Producers/entrepreneurs are stimulated to work hard ✓
• Production of quality products is encouraged ✓
• Entrepreneur shows initiative and drive ✓
• Go-between / intermediaries are eliminated ✓
(Any 3) (3)

2.1.2 THREE ways for solving the problem of oversupply of amadumbe
• Processing of the produce that is in excess / Value adding ✓
• Creation of storage facilities ✓
• Establishment of local, national and international markets / pool marketing system ✓
• Promotion and advertisement of the product ✓
• Diversification/utilising more or other production enterprisers ✓
• Hedging ✓
• Dumping / reducing the price very drastically ✓
• Create more channels of distribution ✓
(Any 3) (3)

2.1.3 FOUR entrepreneurial skills that are required to run the business
• Commitment ✓
• Creativity ✓
• Vision ✓
• Financial skills ✓
• Motivation ✓
• Courage ✓
• Risk management ✓
• Innovation ✓
• Hard-working ✓
• Staying power ✓
• People skills/human relations/cooperation with people ✓
• Technical proficiency ✓
• Decision making skills ✓
• Recordkeeping skills ✓
• Control skills ✓
(Any relevant management skills) (Any 4 x 1) (4)
2.2 Cotton export trends

2.2.1 May ✔ ✔

2.2.2 From 250 - 280 tons ✔

2.2.3 There would be a surplus of cotton / the price for cotton would decrease / export would be performed at a loss ✔ ✔

2.2.4 Factors determining supply:
- Price of cotton ✔
- Production costs/profit margin of the product ✔
- Other competitive products ✔
- Nature/weather/climate ✔
- Technology ✔
- Possibility of increasing the supply of goods and products ✔
- Knowledge ✔
- Fashion ✔
- Demand for the product ✔
- Period of production
- Stability of product ✔

(Any 4)

2.3 Sugar cane plantation

2.3.1 Line graph & rubric:

**Heading:** The graph that represents the relationship between the price of sugar cane from 2005 to 2008

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<th>Correct/Yes (1 mark)</th>
<th>Incorrect/No (0 mark)</th>
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<td>Correct values</td>
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<td>Labeled axes</td>
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<td><strong>4</strong></td>
<td></td>
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</tbody>
</table>

2.3.2 demand ✔
supply ✔

(2)
2.3.3 There was a surplus/oversupply/supply larger than demand ✓
That results in a lower increase in the price of sugar cane ✓
Lower profitability ✓

(Any 2) (2)

2.4 Financial statements in egg production

2.4.1 Farmer A Profit: = Income – Expenditure
= R37 300 – 33 500 ✓
= R3 800 ✓

Farmer B Profit: = Income – Expenditure
= R32 200 – 33 500 ✓
= - R1 300 ✓

(4)

2.4.2 Farmer A ✓– made profit ✓

(2)

2.4.3 • Income – sales of livestock ✓
• Expenditure – operating expenses (layers, feeds, electricity, gas, egg trays, veterinary care, maintenance) ✓
• Profit – gain or loss ✓

(3) [35]

QUESTION 3

3.1 Farm management

3.1.1 Factors that need to be combined in farm management
• Production/physical resources / Environment / Land ✓
• Staffing/human resources / Labour ✓
• Finances / Capital ✓
• Marketing ✓

(4)

3.1.2 Planning / Monitoring / Control ✓

(1)

3.1.3 External influences that may affect the farm as a business
• Political environment/politics ✓
• Global economic environment/economy ✓
• Social environment/society/Effect of HIV/AIDS/Culture / Religion/lifestyle choices ✓
• Legal environment/law/legislation/justice ✓
• Natural disasters/Extreme climatic conditions ✓
• Profitability ✓
• Ethics ✓
• Environmental sustainability ✓
• Competition from other sectors ✓
• Technological forces ✓

(Any 2) (2)
3.1.4 THREE economical characteristics of land
- Can be bought and sold ✓
- Appreciates over time (good investment) ✓
- Has a production potential which influences the market value ✓
- Is indestructible / ✓
- It is connected to the law of diminishing returns ✓
- Good land is limited ✓
- Different production capacities / restrictedness ✓
- Is durable / soil is permanent / long lasting ✓
- Limited to a specific environment / economic situation / fixed ✓
- Availability of agricultural land is limited ✓ (Any 3) (3)

3.2 Farm worker equity schemes

3.2.1 Scheme launched
- Farm Worker Equity Scheme ✓ (1)

3.2.2 Benefits of the scheme:
- Labourers are now shareholders ✓
- Qualify for grants ✓
- Attend training / Skills development ✓
- Team building skills ✓
- Financial skills ✓ (Any 2) (2)

3.2.3 Lack of skill/unskilled labour force/lack of training ✓ (1)

3.2.4 Corresponding Act
- Skills Development Act ✓ (1)

3.2.5 Skills needed for management
- Management skills ✓
- Human relation skills/Interpersonal skills / Team building skills ✓
- Financial skills ✓ (Any 2) (2)

3.2.6 Labour legislation
- Basic Conditions of Employment / Labour relations Act ✓ (1)

3.2.7 Type of labourers at Leliefontein
- Permanent / fixed labourers ✓ – they live on the farm / employed full time basis / only permanent labour are shareholders / qualify for grants ✓ (2)
3.3 Vacancies

3.3.1

<table>
<thead>
<tr>
<th>CANDIDATE</th>
<th>QUALIFICATION LEVEL</th>
<th>MANAGEMENT SKILLS</th>
<th>TECHNICAL SKILLS</th>
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<tbody>
<tr>
<td>A</td>
<td>3 / good ✓</td>
<td>3 / good ✓</td>
<td>1 / weak ✓</td>
</tr>
<tr>
<td>B</td>
<td>1 / weak ✓</td>
<td>1 / weak ✓</td>
<td>3 / good ✓</td>
</tr>
</tbody>
</table>

3.3.2

(a) A ✓ – have good qualifications and management skills ✓
(b) B ✓ – good in technical skills ✓

3.3.3 Candidate A ✓

3.4 Processing of agricultural produce

3.4.1 Capital is expensive/interest is payable/ high risk ✓
Capital is scarce ✓
(Any 1)

3.4.2

(a) C ✓
(b) B ✓

3.4.3 Better price for your product/higher income ✓
More sustainable market/consumers use this product ✓
Because of value adding ✓
Perishability is being reduced / increased shelf life ✓
Introduces variety / more choice is added ✓
(Any 1)

[35]
QUESTION 4

4.1 Research on Bt maize cultivars

4.1.1 Punnet square for crossing of the two cultivars

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<th>A</th>
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<tbody>
<tr>
<td>a</td>
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<tr>
<td>Gametes correctly placed</td>
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<tr>
<td>50% Aa offspring visible</td>
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<td>50% aa offspring visible</td>
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4.1.2 Definition of concepts

(a) Genotype – the genetic make up /code/alleles/composition of an organism

(b) Recessive gene – gene that is overshadowed/dominated in a crossing by another factor/gene and becomes less visible/hidden/does not express itself in the offspring

4.1.3 Characteristics of genetically modified maize

- Pest resistance
- Herbicide resistance
- Drought resistance
- Adaptability to environmental conditions
- Disease resistance
- Early maturing to escape harsh conditions
- Longer period of keeping germination ability

(Any 2) (2)

4.2 Cattle breeding by Bapedi people

4.2.1 Cross-breeding and animals from different households are used (different breeds) increase the fertility and production

OR

Inbreeding and Households share the same animals

The households have the same breed of animal

(Any 1) (2)
4.2.2 Plant medicine/traditional/indigenous medicine ✓

4.2.3 Valued for their fertility and productivity ✓

4.2.4 Crossbreeding is practiced / Fed with specific fodder that is believed to increase the fertility ✓✓

4.3 Variation

4.3.1 Internal causes of variation:
- Recombination of genes/Mutation/abnormalities ✓
- Translocation/Duplication/Inversion/Deletion/Crossing over of chromosomes / Omission ✓
- Meiosis ✓
- Chance fertilization/random fertilization ✓ (Any 2)

4.3.2 Important roles of variation:
- To improve existing breeds/cultivars ✓
- To produce new breeds or cultivars ✓

4.4 Shorthorn breeding

4.4.1 \( r \) ✓ - recessive ✓ OR \( R^w / W \) ✓ - co-dominant ✓

4.4.2 \( Rr / R^w R^w / RW \) ✓ - crossing of red \( R / R^r \) and white \( R^w / W / r \) ✓

4.4.3 This question allows for different interpretations by learners:
- Co-dominance scenario:
  - Pure-bred red animal
  - Pure-bred white animal

(Schematic representation) ✓
OR
Co-dominance scenario (alternative):
Pure-bred red animal          Pure-bred white animal
RR                          WW
R       R                       W           W
9 gametes
RW (roan) 9 RW (roan) 9 RW (roan) 9 RW (roan) □

(Schematic representation) □ (6)

OR
Incomplete dominance scenario:
Pure-bred red animal          Pure-bred white animal
RR                          rr
R       R                       r           r
9 gametes
Rr (roan) 9 Rr (roan) 9 Rr (roan) 9 Rr (roan) □

(Schematic representation) □ (6)

OR
Pure dominance scenario:
Pure-bred red animal          Pure-bred white animal
RR                          rr
R       R                       r           r
9 gametes
Rr (red) 9 Rr (red) 9 Rr (red) 9 Rr (red) □

(Schematic representation) □ (6)

4.5 GMO crop
4.5.1 • A resurrection plant is selected for a desired DNA composition □
• DNA is extracted from this resurrection plant □
• DNA is transferred to a maize plant/GMO plant □
• Different techniques are utilised to transfer the DNA (e.g. the use of the Agro-bacterium tumefaciers as a vector) □
• The GMO plant has a unique/different DNA composition □
• The GMO plant has more desired characteristics □ (Any 3) (3)
4.5.2 Benefits of GM crops

- More productive with higher yields ✓
- Resistant to pests and diseases hence reduce the use of chemicals ✓
- Tolerant to harsh conditions / resist hot temperatures ✓
- Longer shelf life and better properties ✓
- Better flavour, colour, texture and nutritional value ✓
- Cheaper and more plentiful food ✓
- Keeping germination ability over a longer period of time / longer viability of seed ✓
- Formation of new substances ✓
- Shorter / Longer growing period / Early / Late maturing ✓

(Any 2) (2)

[35]

TOTAL SECTION B: 105
GRAND TOTAL: 150