This question paper consists of 15 pages.
INSTRUCTIONS AND INFORMATION

1. This question paper consists of TWO sections, namely SECTION A and SECTION B.

2. Answer ALL the questions in the ANSWER BOOK.

3. Start EACH question on a NEW page.

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

5. Non-programmable calculators may be used.

6. Show ALL your calculations, including formula, where applicable.

7. 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 write only the letter (A–D) next to the question number (1.1.1–1.1.10) in the ANSWER BOOK, for example 1.1.11 A.

1.1.1 The type of animals that feed primarily on roughage:

A  Pigs  
B  Chickens  
C  Cattle  
D  Ducks

1.1.2 The metabolic energy value of a feed is equal to the gross energy of the feed minus the energy lost in the …

A  manure, urine and body heat.  
B  gases, urine and body heat.  
C  manure, gases and body heat.  
D  manure, urine and gases.

1.1.3 Diffusion is the process that refers to the movement of molecules or particles ...

(i)  from a higher to a lower concentration.  
(ii)  from a lower to a higher concentration.  
(iii)  along the concentration gradient.  
(iv)  against the concentration gradient.

Choose the correct combination:

A  (i) and (iv)  
B  (i) and (iii)  
C  (ii) and (iii)  
D  (ii) and (iv)

1.1.4 Animals can obtain water from the following water sources:

A  Converted water, drinking water and water from feeds  
B  Metabolic water, drinking water and water from feeds  
C  Essential water, converted water and drinking water  
D  Forced water, drinking water and water from feeds
1.1.5 ONE of the following combinations of diseases can be classified as bacterial diseases:

A  Rabies and anthrax
B  Red water and Newcastle disease
C  Lumpy wool and Rift Valley fever
D  Mastitis and tuberculosis (TB)

1.1.6 Incorrect handling of farm animals may lead to pale and exudative meat, poor grading of carcasses due to bruising as well as ... after slaughtering.

A  yellow-coloured fat
B  softening of the meat
C  softer bones
D  delayed rigor mortis

1.1.7 The cheapest and most sustainable way of increasing production output in organic animal production is to use ...

A  automated environmental control in a shelter.
B  an effective breeding programme.
C  growth stimulants.
D  chemicals to prevent diseases.

1.1.8 The hormone responsible for the development of secondary masculine sexual characteristics is secreted by part ...

A  1.
B  2.
C  3.
D  4.
1.1.9 … refers to the attachment of the embryo to the endometrium of a sow.

A Gestation
B Synchronisation
C Implantation
D Copulation

1.1.10 The new-born calf or lamb is given colostrum to increase …

A resistance to diseases.
B milk production.
C contraction of voluntary muscles.
D hormonal function. (10 x 2)

1.2 Indicate whether each of the descriptions in COLUMN B applies to A ONLY, B ONLY, BOTH A AND B or NONE of the items in COLUMN A. Write A only, B only, both A and B or none next to the question number (1.2.1–1.2.5) in the ANSWER BOOK, for example 1.2.6 B only.

Example: 1.2.6

<table>
<thead>
<tr>
<th>COLUMN A</th>
<th>COLUMN B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize meal</td>
<td>A feed with a high protein content</td>
</tr>
<tr>
<td>Carcass meal</td>
<td></td>
</tr>
</tbody>
</table>

Answer: 1.2.6 B only

<table>
<thead>
<tr>
<th>COLUMN A</th>
<th>COLUMN B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitamin A</td>
<td>A deficiency of this nutrient can cause parakeratosis</td>
</tr>
<tr>
<td>Vitamin D</td>
<td></td>
</tr>
<tr>
<td>Animals become tame</td>
<td>Consequence of the correct and frequent handling of animals</td>
</tr>
<tr>
<td>Aggressive temperament</td>
<td></td>
</tr>
<tr>
<td>Foot-and-mouth disease</td>
<td>Example of a viral disease</td>
</tr>
<tr>
<td>Rift Valley fever</td>
<td></td>
</tr>
<tr>
<td>90 days</td>
<td>The dry period of dairy cattle before their next parturition</td>
</tr>
<tr>
<td>60 days</td>
<td></td>
</tr>
<tr>
<td>Reproductive cloning</td>
<td>New organism is created</td>
</tr>
<tr>
<td>Therapeutic cloning</td>
<td></td>
</tr>
</tbody>
</table>
1.3 Give ONE word/term/phrase for each of the following descriptions. Write only the word/term/phrase next to the question number (1.3.1–1.3.5) in the ANSWER BOOK.

1.3.1 Strategic plan for livestock farmers to ensure that there is enough feed on the farm to meet all the requirements of animals for a period of one year

1.3.2 A permanent handling facility used to restrain a bull by its head

1.3.3 A pair of globular glands that look like a cluster of grapes and which are the largest secondary sex glands of a bull

1.3.4 The process that results in eggs or ova being formed

1.3.5 An inflammatory bacterial disease that could be acute or chronic and which attacks the udder of a cow

(5 x 2) (10)

1.4 Change the UNDERLINED WORD(S) in each of the following statements to make them TRUE. Write only the answer next to the question number (1.4.1–1.4.5) in the ANSWER BOOK.

1.4.1 Mastication is a chemical form of digestion which increases the surface area of food for effective enzyme activity.

1.4.2 A feeding approach where animals have unlimited access to a supplement and can eat when and as much as they wish is called fodder feeding.

1.4.3 Quarantine involves the management practice and strategy that controls the introduction and spreading of diseases through contact.

1.4.4 Painting the teats of sows with zinc decreases the chances of anaemia in piglets.

1.4.5 Transplantation is a technique used on female animals to make them come into heat approximately at the same time. (5 x 1) (5)

TOTAL SECTION A: 45
SECTION B

QUESTION 2: ANIMAL NUTRITION

Start this question on a NEW page.

2.1 The diagram below shows the path of food in the stomach of a farm animal.

2.1.1 Identify the type of animal that has the stomach shown in the diagram above. (1)

2.1.2 Identify the processes illustrated by arrows A, B and C. (3)

2.1.3 The process illustrated by arrow B has advantages for this farm animal. Justify this statement by stating THREE advantages. (3)
2.2 The table below indicates the quality of pastures and nutritional values over three seasons.

<table>
<thead>
<tr>
<th>SEASON</th>
<th>PASTURE QUALITY</th>
<th>NUTRITIONAL VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer</td>
<td>High</td>
<td>High protein and energy</td>
</tr>
<tr>
<td>Winter</td>
<td>Low</td>
<td>Low quality protein, dry pasture</td>
</tr>
<tr>
<td>Spring</td>
<td>Good (new growth)</td>
<td>Increased protein content</td>
</tr>
</tbody>
</table>

2.2.1 Briefly describe how the population size of the following micro-organisms in the reticulo-rumen of animals grazing on this pasture will differ with the seasons by referring to:

(a) Amylolytic bacteria in summer (2)
(b) Proteolytic bacteria in winter (2)

2.2.2 Describe the quality of a supplementary feed that will be supplied in these pastures during winter. (2)

2.2.3 Name the vitamin that is likely to be deficient in animals feeding on dry pasture. (1)

2.3 An animal consumes 24 kg of hay with a moisture content of 12%. It excretes 7.3 kg of dry manure.

2.3.1 Calculate the coefficient of digestibility of this hay. (5)

2.3.2 The hay mentioned above cannot be recommended for dairy cows as the only source of feed. Justify the statement. (2)

2.4 The table below indicates the composition of two animal feeds.

<table>
<thead>
<tr>
<th>FEED A</th>
<th>FEED B</th>
</tr>
</thead>
<tbody>
<tr>
<td>80% TDN</td>
<td>50% TDN</td>
</tr>
<tr>
<td>8% DP</td>
<td>4% DP</td>
</tr>
<tr>
<td>4 mg of calcium</td>
<td>2 mg of calcium</td>
</tr>
<tr>
<td>6% crude fibre</td>
<td>12% crude fibre</td>
</tr>
</tbody>
</table>

2.4.1 Identify the feed that will most likely be fed to non-ruminant animals. (1)

2.4.2 Motivate the answer to QUESTION 2.4.1. (2)

2.4.3 Calculate the nutritive ratio of FEED B. (3)
2.5 The graph below illustrates a fodder-flow programme. Answer the questions that follow.

![Graph of Quantities of feeds in a fodder-flow programme for a period of one year]

2.5.1 Deduce, from the bar graph above, the number of months during which there will be more feed available than required by animals. (1)

2.5.2 Indicate a particular month during which the available feed will be most insufficient for the animals. (1)

2.5.3 Calculate the shortage of feed during October in kilograms (kg). (3)

2.5.4 Suggest THREE cost-effective measures for better utilisation of feed that could be applied in January and February. (3) [35]
QUESTION 3: ANIMAL PRODUCTION, PROTECTION AND CONTROL

Start this question on a NEW page.

3.1 The production system below is commonly used in rural communities on a small scale. Chickens are fed using leftover food from the house and grain crops from fields.

3.1.1 Identify the type of poultry production system above that is normally used by rural communities. (1)

3.1.2 Name THREE advantages of the system in QUESTION 3.1.1. (3)

3.1.3 State THREE problems that could be associated with this type of production system. (3)
3.2 The structures, apparatus and appliances below are used in the handling and management of farm animals in an animal production system.

- Barbed wire fence to divide areas of farmland
- A separate crush
- Red flags and warning signs
- Kraal made with branches and sticks
- A shed made with wooden poles and canvas

Indicate which of the above-mentioned structures, apparatus and appliances will be most suitable to use in each of the following situations:

3.2.1 The implementation of a rotational grazing system (1)
3.2.2 Subsistence farmers use this structure to house animals at night (1)
3.2.3 Protection of young lambs against cold and wind (1)
3.2.4 A herd of cattle crossing a public road (1)

3.3 The farmers below are involved in two different production systems.

<table>
<thead>
<tr>
<th>FARMER A</th>
<th>FARMER B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farming in a 4 800 ha semi-arid area with 2 workers. The farm has 1 farm shed, 8 wind pumps, 1 cattle-handling facility, 1 dipping station and 400 cattle kept on natural pasture.</td>
<td>Farming in a 400 ha wet area with 20 workers. The farm has 6 farm sheds, 25 feedlot camps, 3 cattle-handling facilities, 3 dipping stations and 3 500 cattle.</td>
</tr>
</tbody>
</table>

3.3.1 Identify the farming system practised by FARMER A. (1)
3.3.2 Give TWO reasons from the table that support the answer to QUESTION 3.3.1. (2)
3.3.3 Briefly distinguish between the feeding strategies followed by FARMER A and FARMER B. (2)
3.3.4 State TWO measures that FARMER A can take to increase production. (2)
3.4 Body temperature, the number of breaths per minute and the rate of the heartbeat of the animal are major indicators of the health of an animal.

3.4.1 Name the body part of a cow where the thermometer is inserted to take body temperature.

3.4.2 An animal has an acute illness. What will the status of the following health indicators of this animal be:

(a) Body temperature
(b) Respiratory rate
(c) Heart beat

3.5 The picture below is based on the control of external parasites.

### Prevent this ...

<table>
<thead>
<tr>
<th>![Tick on Animal]</th>
<th>![Chemical Bottle]</th>
</tr>
</thead>
</table>

### with ...

**Delete ALL**


- Ready-to-use – pour-on
- Residual action
- Non-systemic action
- Deltamethrin 0,50% m/v
- Amitrax 2,0% m/v
- Piperonyl Butoxide 2,0% m/v

3.5.1 Identify the type and the name of the tick treated with this medication.

3.5.2 Indicate ONE animal disease that is transmitted by the tick in QUESTION 3.5.1.

3.5.3 The chemical above is considered to be eco-friendly. Justify this statement by giving TWO reasons from the data in the picture.

3.5.4 Suggest an appropriate method of applying this chemical.
3.5.5 The role of the state is to have control over medicines and remedies such as the one in the picture. Justify this statement by giving TWO aspects from the data above. (2)

3.6 Farmers need to be aware of plants that pose a danger to livestock because they are poisonous.

3.6.1 Name TWO plants that are normally found on natural pastures and could be poisonous to animals. (2)

3.6.2 Indicate THREE measures the farmer can take to prevent plant poisoning. (3)

QUESTION 4: ANIMAL REPRODUCTION

Start this question on a NEW page.

4.1 The diagram below represents the female reproductive system.

![Diagram of female reproductive system]

4.1.1 Identify parts A, B, C and F. (4)

4.1.2 Indicate the letter (A–G) and the name of the part that is usually plugged with alkaline mucus during pregnancy. (2)
4.2 The data below represents hormone levels during the oestrus cycle.

<table>
<thead>
<tr>
<th>DAYS</th>
<th>PROGESTERONE LEVEL CONCENTRATION (mg/ml)</th>
<th>OESTROGEN LEVEL CONCENTRATION (mg/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>32</td>
<td>2</td>
</tr>
<tr>
<td>12</td>
<td>32</td>
<td>2</td>
</tr>
<tr>
<td>16</td>
<td>32</td>
<td>2</td>
</tr>
<tr>
<td>20</td>
<td>3</td>
<td>30</td>
</tr>
<tr>
<td>24</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

4.2.1 Draw a line graph to illustrate the levels of progesterone and oestrogen on different days during the oestrus cycle. (6)

4.2.2 Suggest the role of progesterone from day 8 to day 16. (1)

4.2.3 Deduce from the data above the day when the follicles will be fully developed. (1)

4.2.4 Motivate the answer to QUESTION 4.2.3 by referring to the graph. (1)

4.3 The diagram below illustrates a sperm cell.

4.3.1 Identify part B. (1)

4.3.2 Write down the letter of the part that represents the acrosome. (1)

4.3.3 Name ONE function of part E. (1)

4.3.4 Distinguish between a sperm cell and semen. (2)

4.3.5 Indicate TWO methods of collecting semen from bulls. (2)
4.4 Artificial Insemination (AI) makes it possible for farmers to impregnate most female animals on the farm. To get the expected results the farmer needs to observe the oestrus cycles of female animals in order to detect heat and readiness for insemination.

4.4.1 Define *artificial insemination*. (2)

4.4.2 State THREE main requirements for successful artificial insemination of farm animals. (3)

4.5 The statements below indicate the main stages of a reproductive technique conducted in cows:

A. Flushing the embryo from the donor cow
B. Artificial insemination of the donor cow
C. Super ovulation of the donor cow
D. Placement of the embryo in the recipient cow
E. Synchronisation of both donor and recipient cows

4.5.1 Identify the reproductive technique above. (1)

4.5.2 Re-arrange the above statements (A–E) in the correct order. (5)

4.5.3 State TWO benefits of this reproductive technique. (2)

[35]

**TOTAL SECTION B:** 105
**GRAND TOTAL:** 150
MARKS: 150

This memorandum consists of 10 pages.
SECTION A

QUESTION 1

1.1 1.1.1  C ✔✔  
      1.1.2  D ✔✔  
      1.1.3  B ✔✔  
      1.1.4  B ✔✔  
      1.1.5  D ✔✔  
      1.1.6  D ✔✔  
      1.1.7  B ✔✔  
      1.1.8  D ✔✔  
      1.1.9  C ✔✔  
      1.1.10 A ✔✔  (10 x 2) (20)

1.2 1.2.1  None ✔✔  
      1.2.2  A only ✔✔  
      1.2.3  Both A and B ✔✔  
      1.2.4  B only ✔✔  
      1.2.5  A only ✔✔  (5 x 2) (10)

1.3 1.3.1  Fodder/feed flow ✔✔  
      1.3.2  Neck/head clamp ✔✔  
      1.3.3  Seminal vesicle/vesicular glands ✔✔  
      1.3.4  Oogenesis/ovigenesis ✔✔  
      1.3.5  Mastitis ✔✔  (5 x 2) (10)

1.4 1.4.1  Mechanical/physical ✔  
      1.4.2  Cafeteria style/ad lib/free choice ✔  
      1.4.3  Isolation/separation ✔  
      1.4.4  Iron/Fe/ferrous sulphate ✔  
      1.4.5  Synchronisation ✔  (5 x 1) (5)

TOTAL SECTION A:  45
SECTION B

QUESTION 2: ANIMAL NUTRITION

2.1 Path of food in the stomach of a ruminant

2.1.1 Identification of the type of animal
- Ruminant/cattle/sheep/goats ✓

2.1.2 Identification of the processes illustrated by A, B and C
A. Swallowing/peristalsis/ingestion/intake of food ✓
B. Regurgitation/retro-peristalsis ✓
C. Re-swallowing/peristalsis ✓

2.1.3 Justification of the advantages of process B
- Food broken down mechanically into finer particles ✓
- Increases surface area of food ✓
- Stimulates secretion of saliva to maintain rumen pH levels ✓
- Improves the mixing of food ✓
- The forming of bolus ✓ (Any 3)

2.2 The quality of pastures and nutritional values over three seasons

2.2.1 Description of the size of micro-organism population
(a) Increase/high in population of amylolytic bacteria ✓ ✓ (due to high energy in pasture)
(b) Decrease/low in population of proteolytic bacteria ✓ ✓ (due to low quality protein in pasture)

2.2.2 Quality of supplementary feed in winter
- Supplement high/rich in proteins/nitrogen/NPN ✓ ✓
- Rich in carbohydrates/energy ✓ ✓
- Supplementing with feed rich in minerals/vitamins ✓ ✓ (Any 1)

2.2.3 The vitamin that is likely to be deficient in winter
Vitamin A/retinol ✓

2.3 Coefficient of digestibility of hay

2.3.1 Coefficient of digestibility
DM of hay: \[ 24 \text{ kg} \times \frac{12}{100} = 2,88 \text{ kg} \text{ or } 24 \text{ kg} \times 0,88 = 21,1 \text{ kg} \]

\[ 24\text{ kg} - 2,88 \text{ kg} = 21,1 \text{ kg} ✓ \]

\[ CD = \frac{\text{Dry matter intake (kg)} - \text{dry mass of manure (kg)}}{\text{Dry matter intake (kg)}} \times 100 ✓ \]

\[ = \frac{21,1\text{ kg} - 7,3\text{ kg} \times 100}{21,1\text{ kg}} ✓ \]

\[ = 65,4 ✓ \% ✓ \]

2.4 Description of the different types of feed

2.5 Effect of the amount of feed and the quality of the feed on growth

2.6 Effect of the age of the animal on growth

Copyright reserved
2.3.2 Justification for not recommending the hay

- Digestibility is 65.4% ✓
- therefore it needs supplementation to improve digestibility ✓

2.4 Composition of animal feeds

2.4.1 Feed most likely to be fed to non-ruminant animals

Feed A ✓

2.4.2 Motivation for Feed A

- Contains a low percentage of crude fibre/6% ✓
- High percentage of TDN/80% ✓
- Higher DP/8% ✓
- Therefore it is easily digestible ✓

(Any 2)

2.4.3 Calculation of nutritive ratio of Feed B

\[
NR = \frac{TDN - DP}{DP} ▶️
\]

\[
= \frac{50% - 4%}{4%} ▶️
\]

Or

\[
= \frac{46%}{4%} ▶️
\]

\[
= 1: 11.5/1:12 ▶️
\]

(3)

2.5 Fodder flow programme

2.5.1 Months in which there will be more feed

2/two months ✓

(1)

2.5.2 Month in which the feed will be most insufficient

September/Sep. ✓

(1)

2.5.3 Calculate the shortage of feed during the month of October

- 120 tons − 80 tons = 40 tons ✓
- 40 tons \times 1000 kg \checkmark or \[
\frac{40 \text{ tons}}{1 \text{ ton}} \times 1000 \text{ kg} \checkmark
\]

\[
= 40 \, 000 \, \text{kg} ▶️
\]

(3)

2.5.4 THREE cost-effective measures of using feed for Jan and Feb

- Cutting fodder ✓
- Baling/making hay/ensiling (making silage) ✓
- Storage ✓

(3)

[35]
QUESTION 3: ANIMAL PRODUCTION, PROTECTION AND CONTROL

3.1 System of farming

3.1.1 Identification of a production system
Back yard/free-range/subsistence ✓ (1)

3.1.2 THREE advantages of back yard system to rural communities
- Less expensive/cheaper ✓
- Easy to manage ✓
- No special equipment needed ✓
- No specialised/expert knowledge needed ✓
- More environmental friendly ✓ (Any 3) (3)

3.1.3 THREE problems of backyard system
- Easy to contact disease ✓
- Poor feeding/feeding on less nutritious food ✓
- High risk towards predators ✓
- More feed energy is utilised for non-production purpose/low production output/slow growth rate ✓
- High risk towards theft of animals ✓
- Expose to extreme environmental conditions ✓ (Any 3) (3)

3.2 Structures, apparatus and appliances used in the handling of farm animals in an animal production system

3.2.1 Barbed wire fence to divide area of farmland ✓ (1)
3.2.2 Kraal made from branches and sticks ✓ (1)
3.2.3 A shed made from wooden poles and canvas ✓ (1)
3.2.4 Red flags with warning signs ✓ (1)

3.3 Production systems

3.3.1 Farming system by FARMER A
Extensive system ✓ (1)

3.3.2 TWO reasons
- Fewer workers/2 workers ✓
- Limited facilities/1 cattle handling facility/1 farm shed/8 wind pumps/1 dipping station ✓
- Fewer/smaller number of animals over a large area/400 cattle on 4800 ha ✓
- Cattle kept on natural pasture ✓ (Any 2) (2)

3.3.3 Difference in feeding strategies
- FARMER A is feeding livestock on natural pasture ✓
- FARMER B is feeding livestock through a feedlot ✓ (2)
3.3.4 **TWO measures to increase production for FARMER A**
- Supplementary feeding/nutrition ✅
- Control adverse environmental conditions through shelter ✅
- Control of pests and diseases ✅
- Correct breeding methods ✅
- More effective grazing system/rotational grazing ✅ (Any 2) (2)

3.4 **The health of an animal**

3.4.1 **Part of an animal body in which the thermometer is inserted**
Rectum/anus ✅ (1)

3.4.2 **Health indicators of acute condition**
(a) Increased/high body temperature ✅ (1)
(b) Faster/rapid respiratory rate ✅ (1)
(c) Faster heart beat ✅ (1)

3.5 **Ticks and control**

3.5.1 **Type and name of tick**
- One-host tick ✅
- Blue tick ✅ (2)

3.5.2 **Disease transmitted**
- Red water ✅
- Anaplasmosis/gall sickness ✅ (Any 1) (1)

3.5.3 **Justification of chemical considered eco-friendly**
- Residual action ✅
- Non-systemic ✅
- Ox-pecker compatible ✅ (Any 2) (2)

3.5.4 **Method of applying the chemical**
Pour-on ✅ (1)

3.5.5 **Evidence of the role of state in controlling remedies and medicines**
- Registration number/Reg. No. G2837/Act 36/1947 ✅
- Active ingredients and their quantities/Deltametrin 0.50% m/v, Amitraz 2.0% m/v, Piperonyl Butoxide 2.0% m/v ✅ (2)
3.6 **Plant poisoning**

3.6.1 **TWO plants that are poisonous**
- Poison bulb/leaf ✓
- Thorn apple ✓
- Datura **spp** ✓
- *Lantana camara* ✓
- Drimia species (Slangkop) ✓
- Tulp ✓
- Seneciosis **spp**. ✓
- Pachystriga pygmaeum (Gousiekebossie) ✓
- Diplodiosis ✓
- Geeldikkop ✓
- Vermeersiekte ✓
- Vuursiektebossie ✓
- Lupins ✓
- Blue-green algae ✓
- Buffalo grass ✓
- Devil's thorn ✓

(Any 2) **(2)**

3.6.2 **THREE measures of preventing plant poisoning**
- Remove poisonous plants from pastures/burn the infested areas/application of herbicides/chemicals ✓
- Remove animals from camps infested with poisonous plants ✓
- Feed/water animals well/provide proper nutrition ✓
- Avoid overgrazing ✓
- Practice rotational grazing ✓
- Inspect hay kept in stables ✓
- Knowledge on poisonous plants ✓
- Do not feed animals moulded hay/cut from areas with poisonous plants ✓

(Any 3) **(3)**

**[35]**

**QUESTION 4: ANIMAL REPRODUCTION**

4.1 **Female reproductive organs**

4.1.1 **Identification of parts of a female animal**
- A - Uterine horn ✓
- B - Fallopian tube/oviduct ✓
- C - Ovary ✓
- F - Vagina ✓

(4)

4.1.2 **Letter and name with alkaline plug**
- G ✓
- Cervix ✓

(2)
4.2 Levels of hormones during oestrus cycle

4.2.1 Graph of the hormone levels

Criteria/rubric/marking guidelines
- Correct heading ✓
- Y-axis – correct calibrations and labelled (Concentration) ✓
- X-axis – correct calibrations and labelled (Days) ✓
- Correct unit ✓
- Accuracy ✓
- Line graph ✓ (6)

4.2.2 Role of progesterone
Inhibits/suppresses the secretion/functioning of oestrogen ✓ (1)

4.2.3 Day when follicles will be fully developed
Day 20 ✓ (1)

4.2.4 Motivation
Oestrogen is at its highest level/30mg/ml ✓
Or
Progesterone is at its lowest levels/3mg/ml ✓ (1)

4.3 Schematic representation of a sperm cell

4.3.1 Identification of part B
Nucleus ✓ (1)

4.3.2 Part representing acrosome
A ✓ (1)
4.3.3 The function of part labelled E
Movement/mobility/motility of the sperm cell ✓  (1)

4.3.4 Distinction between a sperm cell and semen
- Sperm - Male gamete/reproductive cell ✓
- Semen - Mixture of sperm cells and fluids produced by accessory glands ✓  (2)

4.3.5 TWO methods of collecting semen
- Artificial vagina ✓  (2)
- Electrical stimulator/electrojaculator ✓

4.4 Artificial insemination in farm animals

4.4.1 Definition of AI
- A technique whereby semen is artificially collected from bulls ✓
- and artificially placed into the reproductive tract of a female ✓  (2)

4.4.2 THREE requirements for successful AI
- Correct detection of heat/oestrus ✓
- Correct timing ✓
- Use of viable semen ✓
- Correct technique ✓
- Experienced and knowledgeable inseminator ✓
- Observation of hygiene ✓  (Any 3)  (3)

4.5 Stages of embryo transfer

4.5.1 Identification of technique
Embryo transfer/ET ✓  (1)

4.5.2 Correct order of embryo transfer
- E/Synchronisation of both donor and recipient cows ✓
- C/Super ovulation of the donor cow ✓
- B/Artificial insemination of the donor cow ✓
- A/Flushing the embryo from the donor cow ✓
- D/Placement of the embryo in the recipient cow ✓  (5)
4.5.3 **TWO benefits of ET**

- More progeny are produced from the best cows ✓
- Profits are made from sales of quality genetics ✓
- Fast cost effective method to improve genetic make-up of the herd ✓
- Extended reproductive life of older and incapable cows ✓
- Genetics in the herd conserved ✓
- Animals can be bred for improved diseases resistance/milk/meat production (Any 2) (2) [35]

**TOTAL SECTION B:** 105  
**GRAND TOTAL:** 150
This question paper consists of 16 pages.
INSTRUCTIONS AND INFORMATION

1. This question paper consists of TWO sections, namely SECTION A and SECTION B.

2. Answer ALL the questions in the ANSWER BOOK.

3. Start EACH question on a NEW page.

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

5. Non-programmable calculators may be used.

6. Show ALL your calculations, including formulae, where applicable.

7. 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 write only the letter (A–D) next to the question number (1.1.1–1.1.10) in the ANSWER BOOK, for example 1.1.11 A.

1.1.1 Using cultural values would be the most effective way for maize producers to increase the market for their produce in a country with strong cultural groupings. This is applicable to …

A a pig producer using more maize meal for feed mixtures.
B communities eating more indigenous dishes made from maize meal.
C vegetarians eating more products made from maize.
D a dairy farmer utilising more maize meal to prepare a dairy ration.

1.1.2 The statements below are applicable to a niche market:

(i) Selling to a small segment of the market
(ii) Not served by mainstream suppliers
(iii) Promoting the same product in different ways to different groups of consumers
(iv) Low transport costs due to direct sales to consumers

Choose the correct combination:

A (i); (iii) and (iv)
B (i) and (iii)
C (ii); (iii) and (iv)
D (i) and (ii)

1.1.3 In rural communities women cut thatching grass and sell it to either traders in urban areas or to rural people who use it as roofing material. This form of marketing is called …

A free marketing.
B controlled marketing.
C cooperative marketing.
D pool marketing.
1.1.4 The following are challenges experienced when marketing agricultural products:

(i) High volume in relation to value
(ii) Perishability
(iii) Constant supply of produce
(iv) Fluctuations in production that occur in the long term

Choose the correct combination:

A (i); (ii) and (iii)
B (ii); (iii) and (iv)
C (i); (ii) and (iv)
D (i); (iii) and (iv)

1.1.5 Movable capital is usually invested in medium-term assets. Examples of these capital items are ...

A fertiliser and sheep.
B a windmill and a dam.
C equipment and tractors.
D land and pesticides.

1.1.6 Farm labour unrest has been common in recent years and the strikes that followed were the result of dissatisfaction about low wages and poor conditions of service. The following Acts are applicable to this statement:

(ii) Basic Conditions of Employment Act, 1997 (Act 75 of 1997)
(iii) Freedom of Association Act, 1995 (Section 18: Bill of Rights 1995)

Choose the correct combination:

A (i); (ii) and (iii)
B (ii) and (iii)
C (ii); (iii) and (iv)
D (ii) and (iv)

1.1.7 HIV/AIDS can impact negatively on the productivity of any farming enterprise. This impact can be limited by ...

A ensuring good nutrition and poor working conditions.
B talking harshly to infected workers to demoralise them.
C encouraging multiple sexual partners and good nutrition.
D providing good nutrition and proper medication.
1.1.8 Some parent animals have more homozygous dominant alleles than other parent animals and therefore they have a greater ability to transmit their characteristics to their progeny. This capability is called ...

A dominance.
B prepotency.
C atavism.
D progeny inheritance.

1.1.9 Animal A and animal B are progeny from a proven Jersey bull and a tested Brahman cow, while animal C and animal D are progeny from the same Jersey bull and a Jersey cow. Animal A and animal C are therefore called ...

A cross-breeds.
B siblings.
C half-siblings.
D pure breeds.

1.1.10 The sequence from the simpler to the most complex structure that carries the genetic information could be represented as follows:

A gene → chromatid → DNA → chromosome
B DNA → gene → chromatid → chromosome
C chromosome → chromatid → gene → DNA
D chromatid → chromosome → gene → DNA (10 x 2)
1.2 Choose a term/phrase from COLUMN B that matches a description in COLUMN A. Write only the letter (A–J) next to the question number (1.2.1–1.2.5) in the ANSWER BOOK, for example 1.2.6 K.

<table>
<thead>
<tr>
<th>COLUMN A</th>
<th>COLUMN B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2.1 Agricultural produce packaged according to guidelines specified by the relevant authorities</td>
<td>A phenotype</td>
</tr>
<tr>
<td>1.2.2 Strategies that are put in place to make and keep a farm productive and profitable</td>
<td>B heredity</td>
</tr>
<tr>
<td>1.2.3 A production factor which is lost to industries due to competition</td>
<td>C interest</td>
</tr>
<tr>
<td>1.2.4 Passing on the characteristics from one generation to the next</td>
<td>D risk</td>
</tr>
<tr>
<td>1.2.5 It determines the gender of heifers</td>
<td>E fertile land</td>
</tr>
</tbody>
</table>

(5 x 2) (10)

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

1.3.1 A document indicating the expected income and expenditure of a farming business over a period of time in the future
1.3.2 A form of asset used as surety to the lender in order to obtain a fixed capital item
1.3.3 The overall potential threat that any farmer covers when insurance is utilised in the farming business
1.3.4 A form of technology that involves highly advanced scientific techniques of manipulation/insertion of genes to obtain a desired characteristic
1.3.5 The type of characteristics that are determined by a large number of genes and which are responsible for the continuous variation in the phenotypes

(5 x 2) (10)
1.4 Change the UNDERLINED WORD(S) in each of the following statements to make them TRUE. Write only the answer next to the question number (1.4.1–1.4.5) in the ANSWER BOOK.

1.4.1 Controlled marketing is a system where two or more independent organisations work together to meet their common economic, social and cultural needs.

1.4.2 Hedging is a form of marketing where goods are exchanged for other goods or services.

1.4.3 A manager is a person who identifies a unique business opportunity, gathers resources and is willing to take the risk of setting up the business.

1.4.4 Scarcity is when capital goods lose their value as a result of becoming outdated and inefficient due to wear and tear.

1.4.5 Heritability makes it possible to identify individuals in a population for the selection of animals for breeding programmes. (5 x 1) (5)

TOTAL SECTION A: 45
SECTION B

Start this question on a NEW page.

QUESTION 2: AGRICULTURAL MANAGEMENT AND MARKETING

2.1 The table below represents the price of lamb and the number of lambs sold by a farmer in a period of six months. Lambs are marketed at a slaughtering mass of 27 kg.

<table>
<thead>
<tr>
<th></th>
<th>SEPT.</th>
<th>OCT.</th>
<th>NOV.</th>
<th>DEC.</th>
<th>JAN.</th>
<th>FEB.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price (R/kg)</td>
<td>79</td>
<td>81</td>
<td>87</td>
<td>110</td>
<td>75</td>
<td>79</td>
</tr>
<tr>
<td>Number of lambs available to be sold</td>
<td>55</td>
<td>60</td>
<td>65</td>
<td>45</td>
<td>50</td>
<td>35</td>
</tr>
</tbody>
</table>

2.1.1 Draw a line graph to show the relationship between the number of lambs sold in a period of six months and the months of the year. (6)

2.1.2 Deduce the month in which the farmer had the highest income from the sale of lambs. (2)

2.1.3 Refer to the table above and suggest a marketing strategy this farmer could adopt to increase the income possibilities. (1)

2.1.4 Calculate the price per lamb for the following months:

(a) October (2)

(b) December (2)

2.1.5 Suggest an economic reason for the decrease in the supply of lambs by the farmer in February. (1)

2.2 Two groups of learners used different strategies to promote and market their produce from the school garden.

GROUP 1
- Sold vegetables to the local supermarket at a fixed price
- Vegetables from each individual in this group were combined into one stockpile for marketing

GROUP 2
- Sold vegetables from door to door at their own price
- Each individual in the group was responsible for selling their own produce

2.2.1 Identify the marketing system used by GROUP 2. (1)

2.2.2 Refer to the table above and justify with TWO reasons why the marketing system identified in QUESTION 2.2.1 was chosen. (2)
2.2.3 Indicate the group that used the following marketing strategies:

(a) Selling on a contract
(b) Direct sales

2.2.4 GROUP 1 utilised a pool system for marketing. Give a reason to support this statement by referring to the table on the previous page.

2.3 The diagram below represents some of the marketing procedures for an agricultural product.

A

B

C

D

2.3.1 Identify the marketing function represented by A, B and C in the diagram above.

2.3.2 Distinguish between the prices of the agricultural product at A and at D respectively.

2.3.3 The business represented by B evaluated the enterprise using a SWOT analysis. State TWO aspects that would be covered in such an analysis.

2.3.4 A farmer is considering starting a business similar to B on his/her farm. Indicate TWO aspects that should be included in a feasibility study for this business.
2.4 The following is a list of activities that are related to the production and marketing of agricultural products.

- Sales to consumers
- Planning for production
- Soil preparation and planting
- Distribution
- Storage
- Grading

2.4.1 Select and arrange any THREE items in the list above in the correct order in an agri-business chain. (3)

2.4.2 Identify TWO problems with the marketing of agricultural products that are related to the distribution process. (2)

2.4.3 Indicate an activity in the list above that is related to the standardisation of agricultural products. (1)

[35]
QUESTION 3: PRODUCTION FACTORS

Start this question on a NEW page.

3.1 Below is an extract from a contract of employment between a farmer and a farm worker:

<table>
<thead>
<tr>
<th>CONTRACT OF EMPLOYMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. <strong>Particulars of employer:</strong> ELNINO FARMS</td>
</tr>
<tr>
<td>2. <strong>Name:</strong> TR ELNINO</td>
</tr>
<tr>
<td>3. <strong>ID:</strong> 5011016908186</td>
</tr>
<tr>
<td>4. <strong>Particulars of employee:</strong></td>
</tr>
<tr>
<td>4.1 <strong>Name:</strong> V JIVE</td>
</tr>
<tr>
<td>4.2 <strong>ID:</strong> 6901013206181</td>
</tr>
<tr>
<td>5. <strong>Job title:</strong> SPRAY OPERATOR</td>
</tr>
<tr>
<td>6. <strong>Duration of contract:</strong> 1 February 2011 to retirement</td>
</tr>
<tr>
<td>7. <strong>Mode of payment:</strong> MONTHLY SALARY BY CHEQUE</td>
</tr>
<tr>
<td>8. <strong>Amount:</strong> R2 500</td>
</tr>
<tr>
<td>9. <strong>Terms of employment:</strong></td>
</tr>
<tr>
<td>9.1 <strong>Working hours:</strong> 06:00 to 17:00</td>
</tr>
<tr>
<td>9.2 <strong>Leave:</strong> One week paid leave per annum</td>
</tr>
<tr>
<td>10. <strong>Protective clothing:</strong> None</td>
</tr>
</tbody>
</table>

Signature:………………………………. Date: 01/02/2011 at: ELNINO FARM  
(employee – farm worker)

Signature:…………………………….… Date: 01/02/2011 at: ELNINO FARM  
(employer – farmer owner)

3.1.1 Indicate the type of farm worker who signed the contract above. Justify your answer. (3)

3.1.2 Select an item from the contract of employment above that relates to the following labour legislation:

(a) Basic Conditions of Employment Act, 1997 (Act 75 of 1997) (1)

(b) Occupational Health and Safety Act, 1993 (Act 85 of 1993) (1)

3.1.3 Identify an aspect in the contract of employment that contributes to the problem of the scarcity of farm labour. Motivate your answer. (2)

3.1.4 The farm worker mentioned in the contract of employment above was diagnosed with HIV/AIDS. State TWO ways in which this farm worker would have an impact on the productivity of this farming business. (2)
3.2 In the diagram below a farm manager is recording certain aspects of the capital on the farm.

![Diagram showing farm manager and various farm equipment]

3.2.1 Indicate the types of capital represented by A and C in the diagram above.

3.2.2 Give TWO examples of floating capital that would be relevant for the farming operation illustrated above.

3.3 The information below shows the assets and liabilities on a farm.

- Value of farm: R3 500 000
- Tractor loan: R365 000
- Value of vehicles: R275 000
- Overdraft: R150 000
- Bond: R4 200 000
- Cash: R50 000
- Value of buildings: R650 000

<table>
<thead>
<tr>
<th>Assets</th>
<th>Rand</th>
<th>Liabilities</th>
<th>Rand</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>Total</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Net worth</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3.3.1 Re-draw the table above and complete it with the information provided. Calculate the net worth of the farm.

3.3.2 Indicate whether this farming business is viable. Give a reason to support your answer.
3.4 The table below shows the amount of fertiliser applied and the quantity of potatoes produced on a piece of land.

<table>
<thead>
<tr>
<th>INPUT (BAGS OF FERTILIZER)</th>
<th>YIELD (BAGS OF POTATOES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>18</td>
</tr>
<tr>
<td>2</td>
<td>25</td>
</tr>
<tr>
<td>4</td>
<td>27</td>
</tr>
<tr>
<td>6</td>
<td>28</td>
</tr>
<tr>
<td>8</td>
<td>29</td>
</tr>
<tr>
<td>10</td>
<td>29</td>
</tr>
</tbody>
</table>

3.4.1 Identify the economic characteristic shown by the data in the table above. (1)

3.4.2 Deduce the relationship between fertiliser input and potato yield. (2)

3.4.3 Name TWO main measures a farmer can take to make land more productive. (2)

3.5 A group of individuals was accepted for a land reform programme after going through a screening process. Their application for this project was successful because of their ability to set up a budget, organise and make decisions. These individuals commented on it when they realised that legislation governs the production and marketing environment in agriculture. This impacts directly on the profit and available capital of a farming business.

3.5.1 State TWO managerial principles that the group of individuals above need to follow to succeed in a farming business. (2)

3.5.2 Refer to the passage above and indicate TWO external forces that may impact on a farming business. (2)

3.5.3 Briefly describe the following types of essential farm records:

(a) Inventory of moveable assets (2)

(b) Breeding records (2) [35]
QUESTION 4: BASIC AGRICULTURAL GENETICS

Start this question on a NEW page.

4.1 The following is a representation of a dihybrid crossing. Answer the questions using the legend below.

**Legend:**

<table>
<thead>
<tr>
<th>Characteristic 1: (Horn conformation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A - Poll (no horns)</td>
</tr>
<tr>
<td>a - Horns</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Characteristic 2: (Hair colour)</th>
</tr>
</thead>
<tbody>
<tr>
<td>B - Black</td>
</tr>
<tr>
<td>b - Red</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>Ab</th>
<th>aB</th>
<th>ab</th>
</tr>
</thead>
<tbody>
<tr>
<td>AB</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>ABB</td>
<td>AAb</td>
<td>AaB</td>
<td>AaBb</td>
</tr>
<tr>
<td>Ab</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>AAb</td>
<td>AAbb</td>
<td>AAb</td>
<td>Aabb</td>
</tr>
<tr>
<td>aB</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>AaBB</td>
<td>AaBb</td>
<td>AaBb</td>
<td>aaBb</td>
</tr>
<tr>
<td>ab</td>
<td>13</td>
<td>14</td>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>AaBb</td>
<td>aBb</td>
<td>aBb</td>
<td>aabb</td>
</tr>
</tbody>
</table>

4.1.1 State the genotype of the following individuals:

(a) Number 11

(b) Number 14

4.1.2 Determine the phenotype of the following individuals:

(a) Number 6

(b) Number 12

4.1.3 Individual number 6 and individual number 16 were crossed. Draw a Punnett square to determine the genotype of their offspring.

4.1.4 Indicate the phenotype of the crossing in QUESTION 4.1.3.
4.2 The crossings A, B and C below represent different breeding systems applied in cattle farming.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial mixed-breed cow</td>
<td>Sussex bull</td>
<td>Afrikaner bull</td>
</tr>
<tr>
<td>X Holstein stud bull</td>
<td>X Sussex cow (bull's daughter)</td>
<td>X Shorthorn cows</td>
</tr>
</tbody>
</table>

4.2.1 Identify the breeding systems represented by A, B and C. (3)

4.2.2 Indicate the breeding system (A, B or C) that promotes heterosis. (1)

4.2.3 State TWO disadvantages of the breeding system represented by crossing B. (2)

4.2.4 Suggest the best method a farmer can use to change the enterprise from a commercial meat production with Brahman to a Bonsmara stud within a period of 20 years. (1)

4.3 Some Nguni cattle are predominantly dark or light with a distinct colour pattern combined with a variety of other colours. If dark and light-coloured animals are crossed, the offspring are neither dark nor light, but both colour combinations are visible on these animals.

4.3.1 Identify the type of dominance in the scenario above. (1)

4.3.2 When red Shorthorn cattle are crossed with white Shorthorn cattle the result is a roan-coloured offspring. Explain this phenomenon. (2)

4.3.3 Distinguish between incomplete dominance and codominance. (2)

4.4 The DNA of a tomato plant was changed through an advanced modification technique.

4.4.1 Indicate TWO methods which could be used in this modification process. (2)

4.4.2 State TWO disadvantages of using tomatoes with modified DNA. (2)

4.5 Distinguish between continuous variation and discontinuous variation. (2)
Traditionally people used a selection and breeding method whereby the best bulls for growth, health and fertility were shared between family and friends. They also cared for their animals by utilising the best available pastures and keeping them away from wet and muddy areas.

4.6.1 Define the concept selection.

4.6.2 Determine the method of selection mentioned in the passage above.

4.6.3 Identify THREE animal production characteristics in the passage that were used for selection by these people.

4.6.4 Indicate how the following aspects were used by the people in the passage above to improve the phenotype of the animals:

(a) Genetic variation

(b) Environmental variation

TOTAL SECTION B: 105
GRAND TOTAL: 150
MARKS: 150

This memorandum consists of 11 pages.
SECTION A:

QUESTION 1

1.1 1.1.1 B ✓✓
     1.1.2 D ✓✓
     1.1.3 A ✓✓
     1.1.4 C ✓✓
     1.1.5 C ✓✓
     1.1.6 D ✓✓
     1.1.7 D ✓✓
     1.1.8 B ✓✓
     1.1.9 C ✓✓
     1.1.10 B ✓✓
(10 x 2) (20)

1.2 1.2.1 G ✓✓
     1.2.2 J ✓✓
     1.2.3 H ✓✓
     1.2.4 B ✓✓
     1.2.5 F ✓✓
(5 x 2) (10)

1.3 1.3.1 Budget ✓✓
     1.3.2 Collateral/fixed asset ✓✓
     1.3.3 Risk ✓✓
     1.3.4 Genetic modification(GM)/engineering/biotechnology ✓✓
     1.3.5 Quantitative ✓✓
(5 x 2) (10)

1.4 1.4.1 Co-operative/pool ✓
     1.4.2 Bartering ✓
     1.4.3 Entrepreneur ✓
     1.4.4 Depreciation ✓
     1.4.5 Variation/biometrics/EBV ✓
(5 x 1) (5)

TOTAL SECTION A: 45
SECTION B

QUESTION 2: AGRICULTURAL MANAGEMENT AND MARKETING

2.1  The price and the quantity of lambs sold by a farmer over a period of six months

2.1.1  Line graph showing the relationship between the number of lambs sold and the months of the year

![Graph showing the relationship between the number of lambs sold and the months of the year](image)

**Criteria/rubric/marketing guidelines**
- Correct heading ✓
- Y-axis – Correct labelled (Number of lambs) ✓
- X-axis – Correct labelled (Sept. - Feb.) ✓
- Correct calibrations of X and Y axis ✓
- Accuracy ✓
- Line graph ✓ (6)

2.1.2  Month with the highest income
- November ✓✓ (2)

2.1.3  Marketing strategy
- Use of a breeding season/planning for marketing stage ✓
- Supply most of their animals during the festive season/December ✓
- Promotion/advertising/market research ✓
- Market animals when the price is the highest ✓ (Any 1) (1)

2.1.4  Calculation of the price per lamb for
(a) October: 27kg x R81/kg ✓
   = R2 187 ✓ (2)
(b) December: 27kg x R110/kg ✓
   = R2 970 ✓ (2)
2.1.5 Economic reason for a decrease in supply

- Drop in price in January for lambs ✓
- Biggest demand is over/festive season is over/ withholding stock/speculating for a higher price ✓
- Scarcity of money after the festive season ✓
- The farmer ran out of stock/no stock available ✓ (Any 1) (1)

2.2 Marketing strategies

2.2.1 Marketing system for group 2

Free marketing/direct system ✓ (1)

2.2.2 TWO reasons to justification the choice in Question 2.2.1

- Sold vegetables from door to door/sell at any place/no middleman ✓
- Individuals responsible for their own marketing ✓
- Sell at their own price ✓ (Any 2) (2)

2.2.3 Group’s marketing strategy

(a) Group 1 ✓ (1)
(b) Group 2 ✓ (1)

2.2.4 Reason for a pool marketing system

- Sold at a fixed price/price control ✓
- Vegetables were combined/stockpile ✓ (Any 1) (1)

2.3 Diagram of the marketing procedures for an agricultural product.

2.3.1 Identification of marketing function

A: Distribution/transport/delivery ✓
B: Processing/value adding ✓
C: Packaging ✓ (3)

2.3.2 Differentiation of the price of Product:

A - Raw product with a lower price ✓
D - Processed product with a higher price ✓ (2)

2.3.3 TWO aspects of a SWOT analysis

- Strengths ✓
- Weaknesses ✓
- Opportunities ✓
- Threats ✓ (Any 2) (2)
2.3.4 TWO aspect to be included in feasibility study

- Demand for the final product/market research ✓
- Availability of skilled labour ✓
- Capital investment needed/availability of capital ✓
- Support structures needed/resources/storage facilities ✓
- Distance to/from markets/accessibility ✓
- Operation of plant during the off season ✓
- Profitability ✓
- SWOT analysis ✓

(Any 2) (2)

2.4 Activities related to the production and marketing of agricultural product

2.4.1 THREE activities in the following order:

- Planning for production ✓
- Soil preparation and planting ✓
- Grading ✓
- Storage ✓
- Distribution ✓
- Sales to consumers ✓

(Any 3 in a CORRECT ORDER) (3)

2.4.2 TWO problems with the distribution during marketing of agricultural products

- Poor infrastructure/bad roads ✓
- Transportation/wide distribution and distances to markets ✓
- Accidents/theft can cause losses ✓
- High transportation cost ✓
- Spoilage of products in the market chain/perishability ✓
- Products not properly handled/stored ✓

(Any 2) (2)

2.4.3 Activities related to the standardisation of agricultural products

Grading ✓

(1) [35]
QUESTION 3: PRODUCTION FACTORS

3.1 Contract between an employer and an employee

3.1.1 Type of worker signing a contract
- Permanent/fixed/full time worker ✓ (1)

Justification with reason
- Long term employment/1 February 2011 - retirement ✓✓ (Any 1) (2)
- Entitled to some benefits, e.g. annual leave ✓✓

3.1.2 Labour legislation
(a) Basic Conditions of Employment Act.
(Act Number 75 of 1997)
- Duration of contract: 01 February 2011 - retirement or till the contract ends ✓ (1)
- Remuneration/Amount ✓
- Terms of employment/leave/working hours: ✓ (Any 1) (1)

(b) Occupational, Health and Safety Act.
(Act 85 of 1993)
- Protective clothing: ✓ (1)

3.1.3 Aspect that contributes to scarcity of labour:
- Remuneration of R2 500 ✓
- The industry pay more for skilled labour ✓

Or
- Working hours from 06h00 to 17h00 ✓
- Industry is shorter working hours ✓

Or
- Leave: One week paid leave per annum ✓
- Longer/paid leave period is given to workers in industry ✓

Or
- Protective clothing: None ✓
- Dangerous working conditions ✓ (2)

3.1.4 HIV impact on the productivity of a farming business
- Worker would be sick and absent from work ✓
- Lower productivity/worker will work slowly/shorter hours ✓
- Labour shortages/difficult to complete tasks ✓
- Extra financial/cost burden/support on the farmer ✓
- Planning/running the farm becomes more difficult ✓
- Loss of skills/experience ✓ (Any 2) (2)
3.2 **Diagram representing capital forms**

3.2.1 **Types of capital represented by:**
- A - movable capital ✓
- C - fixed/immovable/movable capital ✓

3.2.2 **TWO examples of floating capital in the farming operation**
- Feeds ✓
- Medication/chemicals ✓
- Cleaning/sanitation substances ✓
- Electricity ✓
- Fuel ✓
- Wages/salaries/cash ✓
- Fertilisers/manure ✓
- Stationery ✓
- Seeds ✓

3.3 **Information on assets and liabilities on a farm**

3.3.1 **Table and calculation of the net worth of the farm**

<table>
<thead>
<tr>
<th>✓ Assets</th>
<th>Rand</th>
<th>Liabilities</th>
<th>Rand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm</td>
<td>3 500 000</td>
<td>Tractor loan</td>
<td>365 000</td>
</tr>
<tr>
<td>Vehicles</td>
<td>275 000</td>
<td>✓ Overdraft</td>
<td>150 000</td>
</tr>
<tr>
<td>Cash</td>
<td>50 000</td>
<td>Bond</td>
<td>4 200 000</td>
</tr>
<tr>
<td>Buildings</td>
<td>650 000</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4 475 000</strong></td>
<td><strong>Total</strong></td>
<td><strong>4 715 000</strong></td>
</tr>
<tr>
<td>Net worth</td>
<td>R 4 475 000 – R 4 715 000 = R – 240 000 or (R240 000 deficit)</td>
<td>✓✓</td>
<td></td>
</tr>
</tbody>
</table>

**Mark allocation/marketing guidelines/rubric:**
- Redrawing the table with the correct headings
- Assets sorted correctly
- Total of assets
- Liabilities sorted correctly
- Total of liabilities
- Net worth

3.3.2 **Viability of the farming business**
- Not viable ✓
- **Justification with reason**
- Loss/deficit of – R240 000/insolvent/bankrupt/liabilities are greater than the assets ✓
3.4 Fertilizer applied and the quantity of potato produced on piece of land

3.4.1 Economic characteristic shown by the data in the table
- The law of diminishing returns ✓

3.4.2 Relationship between fertilizer input and yield
- Potato yield will increase with an increase in fertiliser input until optimum production is reached ✓
- A further increase in fertiliser input result in a decreasing increase of potato yield ✓
- After that production of potatoes will stabilise/remain constant ✓

3.4.3 TWO measures a farmer can employ to the land in order to be more productive
- Scientific/precision farming methods/fertiliser/manure/correct cultivation methods/crop rotation ✓
- Consolidation of small/uneconomic units ✓
- Restoring land potential/resting the land/correct land utilisation ✓
- Responsible application chemicals/pesticides/herbicides ✓
- Irrigation/permanent water supply ✓

3.5 Passage on managerial principles

3.5.1 TWO managerial principles
- Planning ✓
- Organization/co-ordination ✓
- Decision making ✓
- Control ✓
- Motivation ✓
- Communication ✓
- Leading and direction ✓
- Monitoring ✓
- Implementation ✓

3.5.2 TWO external forces
- Legal/legislation/politics ✓
- Economic/marketing environment ✓
- Capital/funding ✓

3.5.3 Types of essential farm records
- (a) List/record ✓ of assets/all the machinery/equipment/livestock/other moveable items on the farm ✓
- (b) A record of all the breeding stock ✓ that is used in a particular breeding program and their activities ✓

[35]
QUESTION 4: BASIC AGRICULTURAL GENETICS

4.1  Dihybrid crossing on horns and hair colour

4.1.1 The genotype of individual number 11 and 14
(a) 11 - aaBB ✓
(b) 14 - Aabb ✓

4.1.2 The phenotype of individual number 6 and 12
(a) 6 - Red and polled/no horns ✓
(b) 12 - Black and horned ✓

4.1.3 Phenotype of the offspring between number 6 and 16:

```
<table>
<thead>
<tr>
<th>✓</th>
<th>Ab</th>
<th>Ab ✓</th>
</tr>
</thead>
<tbody>
<tr>
<td>ab</td>
<td>Aabb</td>
<td>Aabb ✓</td>
</tr>
<tr>
<td>✓ ab</td>
<td>Aabb</td>
<td>Aabb</td>
</tr>
</tbody>
</table>
```

Mark allocation/markng guidelines/rubric
• Punnet square
• Parent 1 gametes
• Parent 2 gametes
• Genotype of offspring

4.1.4 Phenotype of the crossing in QUESTION 4.1.3
• Red and polled/no horns ✓

4.2 Breeding systems and technologies

4.2.1 The breeding methods:
A. Upgrading ✓
B. Inbreeding ✓
C. Crossbreeding ✓

4.2.2 Breeding method for heterosis
C/A ✓

4.2.3 TWO disadvantages of inbreeding
• Loss of vigour/performance/inbreed depression ✓
• Loss of fertility ✓
• Smaller genetic variation ✓
• Increase of lethal genes which can result in death ✓
• Reduced vitality ✓
• Fixation of undesired genes ✓
• Expert knowledge required ✓
• Less resistance to diseases ✓
• Poorly adapted to the environment ✓
• Deformed animals ✓

(Any 2)

4.2.4 Change the enterprise from Brahman to a Bonsmara
Upgrading/A ✓
Nguni cattle with a distinct colour pattern

4.3.1 Identify this type/mechanism of heredity
- Co-dominance ✓

4.3.2 Explanation of colour combination
- Both white and red hair fibres are present ✓
- The offspring has the phenotype of both parents ✓
- No intermediate/mixture of colour is formed ✓ (Any 2)

4.3.3 Difference between incomplete and co-dominance
- Incomplete dominance
  Offspring has a phenotype that is in-between those of the parents ✓
- Co-dominance
  Offspring has the phenotype/colour of both parents ✓

4.4 Techniques to change DNA of tomato plant

4.4.1 TWO other methods
- Micro-injection ✓
- Gene gun/biolistic ✓
- Agro-bacterium tumefaciens ✓
- Electroporation ✓
- Recombination DNA ✓
- Calcium phosphate precipitation ✓
- Gene silencing ✓
- Gene splicing ✓
- Lipofection ✓ (Any 2)

4.4.2 TWO disadvantages of DNA modified tomatoes
- Health concerns/allergies ✓
- Not enough research has been done ✓
- Expensive ✓
- Super weeds develop from tomato pollen ✓
- Religious beliefs ✓ (Any 2)

4.5 Differences between continuous and discontinuous variation

Continuous variation
- There is a complete range of characteristics from one extreme to another ✓

Discontinuous variation
- Characteristics have a few clear-cut forms/no intermediate forms in between ✓
4.6 Traditional selection method

4.6.1 Define selection
- Process of choosing/identifying specific individuals ✓
- For their desired characteristics/traits ✓
- To be used in the production of quality offspring ✓ (Any 2)  (2)

4.6.2 Method of selection in the scenario.
- Mass selection ✓  (1)

4.6.3 THREE characteristic considered for selection
- Growth ✓
- Health ✓
- Fertility ✓  (3)

4.6.4 Aspects to improve phenotype of animals
(a) Best bulls for growth/health/fertility were shared ✓  (1)
(b) Utilizing the best available pastures/keeping them away from wet/muddy areas ✓  (1)

TOTAL SECTION B: 105
GRAND TOTAL: 150