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. Show ALL your calculations.

10. 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: 1.1.11 A B C D

1.1.1 The part of the alimentary canal of a fowl that is responsible for storing, moistening and softening food is the ...

A proventriculus.  
B gizzard.  
C ventriculus.  
D crop.

1.1.2 The process whereby food is pushed through the alimentary canal by waves of contraction and relaxation of muscles is known as ...

A rumination.  
B digestion.  
C peristalsis.  
D absorption.

1.1.3 The palatability and digestibility of a low-grade roughage for a ruminant can be improved by ...

A supplementing it with molasses.  
B adding cellulose.  
C supplementing it with teff hay.  
D supplementing it with non-nitrogenous substances.

1.1.4 A shortage of iron in the bodies of farm animals leads to a condition known as ...

A goitre.  
B anaemia.  
C parakeratosis.  
D pica.
1.1.5 An indication of heat stress in pigs is ...

A screaming.
B a higher respiratory rate.
C shivering.
D hyperactivity.

1.1.6 The farm housing structure below shows a shed that houses a large number of beef cattle. It is normally designed to protect these animals from ...

A uncontrolled mating.
B adverse environmental conditions.
C infectious diseases.
D internal parasites.
1.1.7 The diagram below illustrates the route of an egg cell from fertilisation to implantation.

The differentiation of cells into tissues and organs occurs in the stage indicated by ...

A D.
B C.
C B.
D A.

1.1.8 A visible sign shown by a cow that is about to give birth:

A Searches for a bull
B Attempts to urinate and defecate more frequently
C Prefers feeding on concentrates
D Stays with the calves

1.1.9 Parasites in the alimentary canals of farm animals that are responsible for a shortage of red blood cells are ...

A blowflies.
B mites.
C ticks.
D roundworms.
1.1.10 The disease in farm animals that leads to aggressive behaviour, frequent bellowing, excessive salivation and paralysis of the hindquarters is ...

A bluetongue.  
B bird flu.  
C foot-and-mouth disease.  
D rabies. 

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 appropriate block 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 maize meal</td>
<td>an example of a concentrate that is rich in protein</td>
</tr>
</tbody>
</table>

Answer:  

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

<table>
<thead>
<tr>
<th>COLUMN A</th>
<th>COLUMN B</th>
</tr>
</thead>
<tbody>
<tr>
<td>A dosing</td>
<td>method to supplement deficient minerals in farm animals</td>
</tr>
<tr>
<td>B injections</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COLUMN A</th>
<th>COLUMN B</th>
</tr>
</thead>
<tbody>
<tr>
<td>A nutrition</td>
<td>aspects used to manage the health of farm animals for optimal production in intensive production units</td>
</tr>
<tr>
<td>B hygiene</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COLUMN A</th>
<th>COLUMN B</th>
</tr>
</thead>
<tbody>
<tr>
<td>A corpus luteum</td>
<td>necessary for the formation of the Graafian follicles in cows</td>
</tr>
<tr>
<td>B progesterone</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COLUMN A</th>
<th>COLUMN B</th>
</tr>
</thead>
<tbody>
<tr>
<td>A ovulation</td>
<td>release of female reproductive cells for fertilisation</td>
</tr>
<tr>
<td>B gestation</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COLUMN A</th>
<th>COLUMN B</th>
</tr>
</thead>
<tbody>
<tr>
<td>A flush feeding</td>
<td>supplementary feeding that promotes the ovulation rate</td>
</tr>
<tr>
<td>B concentrate feeding</td>
<td></td>
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</table>

(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 A vitamin needed for the normal absorption of calcium and phosphorus from the gastrointestinal tract

1.3.2 The collective name for the finger-like projections in the rumen of farm animals

1.3.3 The process during which ground lucerne is compressed

1.3.4 A long, thin tube used to deposit semen into the uterus of female animals during artificial insemination

1.3.5 A preventative measure whereby sick animals with contagious diseases are kept away from the herd to prevent the spread of diseases

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

1.4.1 Micro-organisms in the abomasum hydrolyse proteins to form peptides, amino acids and ammonia.

1.4.2 A production ration is the quantity of feed necessary to sustain the body mass and composition of farm animals.

1.4.3 Metoestrus (Metestrus) is the longest period of the oestrus cycle that allows for the development of the corpus luteum.

1.4.4 Toxins are chemicals produced in the animal body to provide protection from diseases.

1.4.5 Milk fever is a metabolic disease that can be controlled with iron supplements.

TOTAL SECTION A: 45
SECTION B

Start this question on a NEW page.

QUESTION 2: ANIMAL NUTRITION

2.1 The diagram below illustrates the digestive system of a ruminant.

2.1.1 Select THREE labelled parts that constitute the forestomach of ruminant animals. (3)

2.1.2 State TWO ideal conditions required for microbial activity in the ruminant stomach. (2)

2.1.3 Describe TWO functions of micro-organisms in the digestive system of ruminants. (2)

2.1.4 Enzymatic digestion of feed occurs in the true stomach of a ruminant animal. Give a reason to support this statement. (2)

2.1.5 Name a part in the digestive system of a fowl that is adapted to perform the same function as the true stomach of ruminant animals. (1)
2.2 The structure below represents a cross section of a villus.

2.2.1 Name a part in the alimentary canal where the structure illustrated above is found. (1)

2.2.2 Name the main nutrients absorbed by parts A and B. (2)

2.2.3 Describe how the villus is suited to its function of absorption. (2)

2.3 Vitamin A is produced by ruminant animals such as cattle, sheep and goats from a pigment found in green grass and stored in the liver. When no green grass is available during the dry period, the animals will use the vitamin A stored in the liver. It is thus advisable to supplement it during winter in a summer-rainfall area.

[Source: Farming SA, September 2011]

2.3.1 Indicate a season of the year when vitamin A is mainly supplemented and support your answer by referring to the data given in the passage above. (2)

2.3.2 Name TWO methods used to supplement vitamin A. (2)

2.4 The digestibility coefficient of a feed is that portion of the feed that is taken in by the animal, digested, absorbed and used for body functions. It is not excreted in the manure and is expressed as a percentage of dry matter. A cow eats 30 kg of concentrate with a moisture content of 10% and 16 kg material is excreted in the manure with a moisture content of 35%.

2.4.1 Use an appropriate formula to calculate the digestibility coefficient of this feed. Show ALL your calculations. (5)
2.4.2 Explain how the quantity of feed taken in can affect the digestibility of a feed. (2)

2.5 A cow was given a feed with a total digestible nutrient (TDN) value of 75% and a digestible protein (DP) value of 20%. Calculate the following:

2.5.1 The percentage of digestible non-nitrogenous substances of this feed (1)

2.5.2 The nutritive ratio (NR) of this feed (2)

2.6 As an animal nutritionist on a dairy farm, you are required to compile a balanced ration for lactating cows using the following feeds:

<table>
<thead>
<tr>
<th>REQUIRED DIGESTIBLE PROTEIN VALUE (DP) %</th>
<th>FEED</th>
<th>DIGESTIBLE PROTEIN VALUE (DP) %</th>
</tr>
</thead>
<tbody>
<tr>
<td>16%</td>
<td>A</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>21</td>
</tr>
</tbody>
</table>

2.6.1 Determine the ratio required for each feed by using the Pearson square method. (3)

2.6.2 Calculate the percentage of feed B that should be added to the feed mixture to get the desired digestible proteins in the ration of the cows. Show ALL your calculations. (3) [35]
Angora Farmers Count Their Losses

Four thousand Angora goats died in the cold and wet conditions in the Rietbron and Willowmore areas in July. The newborn animals could not withstand the bitter cold, strong winds and rain. It was not only the loss of animal progeny, but mohair was also lost.

With the assistance of the agricultural extension officer, the farmers were subsidised to build shelters that had special insulation material, foldable walls and heaters.

[Adapted from Farmer’s Weekly, 12 August 2011]

3.1.1 Name the production system practised by the farmers before the cold period in July. Give a reason your answer. (3)

3.1.2 Explain why the above-mentioned solution by the extension officer is recommended for these goats in relation to the following:

(a) Shelter (2)
(b) Insulation material (2)
(c) Heaters (2)

3.1.3 Discuss the necessity of a subsidy (money given by government) to assist the farmers in the passage above. (2)
3.2 The pictures below represent agricultural production. Different groups of farm animals are represented by the letters A to E.

![Diagram of farm animals]

3.2.1 Identify TWO primary products obtained from farm animals in the picture above. (2)

3.2.2 Comment on optimising the production of farm animal C with regard to:

(a) Space requirements (2)
(b) Feeding facilities (2)

3.2.3 Compare the handling facilities that could be used for farm animal B to those of farm animal D. (4)

3.3 Cattle become nervous and wild when exposed to incorrect handling. They can learn to trust and tolerate people if they are treated with understanding and gentleness. Cattle that stress easily are also more likely to have poor quality carcasses that are usually discounted or condemned. Good management can calm wild and stress-prone cattle that produce dark and poor carcasses.

[Adapted from Farmer's Weekly, 1 May 2009]

3.3.1 Identify TWO behavioural patterns of cattle that are not properly handled. (2)

3.3.2 Name TWO economic benefits of good cattle management. (2)
3.4 Research revealed that in the past sheep had lean meat with fat concentrated in certain parts of the body, because these animals adapted themselves to the hardy African conditions. This concentration of fat in certain parts of the body helped with the release of excess body heat in hot conditions. A number of these animal breeds still exist today, for example Blackhead Persian sheep.

Modern farming practices ensure that the fat layer becomes more evenly distributed in the body. These practices lead to a better carcass quality.

The table below represents the body fat concentration of a mutton sheep breed as measured by a commercial livestock breeder:

<table>
<thead>
<tr>
<th>YEARS</th>
<th>BODY FAT CONCENTRATION (HINDQUARTER) (g/100 g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>30</td>
</tr>
<tr>
<td>1970</td>
<td>25</td>
</tr>
<tr>
<td>1980</td>
<td>20</td>
</tr>
<tr>
<td>1990</td>
<td>15</td>
</tr>
<tr>
<td>2000</td>
<td>10</td>
</tr>
<tr>
<td>2010</td>
<td>5</td>
</tr>
</tbody>
</table>

3.4.1 Explain why breeders aim at producing meat with more even fat distribution. 

(2)

3.4.2 Draw a line graph of the total fat content measured over a period of 50 years using the data in the table above. (The $x$-axis represents the year and the $y$-axis the fat content.)

(6)

3.4.3 Describe the trend in fat distribution over a 50-year period evident from the graph.

(2)

[35]
QUESTION 4: ANIMAL REPRODUCTION, PROTECTION AND CONTROL

4.1 The diagrams below represent the reproductive organs of a bull, the processes of sperm formation and the development in the sex cells.

4.1.1 Name parts A, B, C and H. (4)

4.1.2 Identify process K. (1)

4.1.3 State ONE function each of parts D and L. (2)

4.1.4 Describe how congenital defects can influence the process in DIAGRAM 2. (2)

4.1.5 Give a reason why part H in DIAGRAM 1 is situated outside the abdominal cavity of a male animal. (1)
4.2 The graph below shows the levels of two hormones, namely oestrogen and progesterone in a cow that became pregnant.

4.2.1 Identify the times when the levels of oestrogen and progesterone are equal. (2)

4.2.2 Indicate the level of oestrogen in the blood on day 14. (1)

4.2.3 Give evidence from the graph that suggests that an ovum was fertilised. (2)

4.2.4 Explain TWO effects that the peak period of oestrogen has on the animal. (2)

4.2.5 What would happen to the corpus luteum if this cow was not pregnant? (1)

4.3 The passage below deals with the infestation of bont ticks in livestock.

**THE TICK CHALLENGE IN LIVESTOCK**

Ticks play an important role as transmitters of diseases in animals, the type of which depends on the species of tick in question. Diseases such as redwater, gall sickness and heartwater are all acquired via tick bite and subsequent injection of the parasite that enters the bloodstream and causes the disease in the host animal. Production losses occur as a result of such tick-borne diseases by way of underperformance or even death of the infected animals.

Ticks with long mouth parts often create an opening in the skin of an animal that allows for the introduction of bacteria to deeper layers beneath the skin. This results in a loss of tail tips or ear lobes in cattle. In the eastern coastal regions of Southern Africa, the bont tick challenge has led to a loss of teat function in cows as a result of mastitis and abscesses in the udder.

[Source: Farming SA, September 2011]
4.3.1 Give TWO reasons why ticks are the most economically significant parasites in livestock farming by referring to the passage. (2)

4.3.2 Classify the bont tick according to its life cycle and give a reason to support your answer. (2)

4.3.3 Give a possible reason for a serious bont tick outbreak in the coastal region. (2)

4.3.4 Many fly species are also external parasites that bite and suck blood from their host. Name a fly species that attacks open wounds and tick bites in wool sheep breeds. (1)

4.3.5 Name TWO biological methods of controlling ticks. (2)

4.4 Livestock diseases can be caused by a number of disease-carrying agents and have a negative impact on the economy of the country. To prevent these losses a farmer must develop a vaccination plan suitable for his environment.

The following table shows only a part of a sheep vaccination plan.

<table>
<thead>
<tr>
<th>MONTHS</th>
<th>SEASON</th>
<th>STAGE</th>
<th>HEALTH CARE ACTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>September</td>
<td>Spring</td>
<td>Lamb</td>
<td>• Vaccinate against bluetongue after the lambing season.</td>
</tr>
<tr>
<td>October</td>
<td></td>
<td></td>
<td>• Place an order for pulpy kidney vaccine.</td>
</tr>
<tr>
<td>November</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>December</td>
<td>Summer</td>
<td>Weaners</td>
<td>• Vaccinate lambs against pulpy kidney (give booster dose</td>
</tr>
<tr>
<td>January</td>
<td></td>
<td></td>
<td>three weeks later) and bluetongue.</td>
</tr>
<tr>
<td>February</td>
<td></td>
<td></td>
<td>• Place an order for enzootic abortion vaccine for ewes.</td>
</tr>
<tr>
<td>March</td>
<td>Autumn</td>
<td></td>
<td>• Vaccinate ewes against enzootic abortion before the</td>
</tr>
<tr>
<td>April</td>
<td></td>
<td></td>
<td>mating season.</td>
</tr>
<tr>
<td>May</td>
<td></td>
<td></td>
<td>• Place an order for bluetongue vaccine for rams.</td>
</tr>
</tbody>
</table>

4.4.1 From the data above, identify the stage when the vaccine for pulpy kidney was administered. (1)

4.4.2 Identify the minimum time in months that the lambs are kept with the ewes before they are removed. (1)

4.4.3 Why is it important to vaccinate ewes before the mating season? (2)
4.4.4 Explain how the State assists the farmer in the following:

(a) Quarantine services (2)
(b) Veterinary research (2)

[35]

TOTAL SECTION B: 105
GRAND TOTAL: 150
# SECTION A

## QUESTION 1.1

<table>
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<td>A</td>
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<td>C</td>
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<tr>
<td>1.1.10</td>
<td>A</td>
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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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## QUESTION 1.4

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(5 x 1) (5)

**TOTAL SECTION A: 45**
This memorandum consists of 10 pages.
SECTION A

QUESTION 1.1

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(10 x 2) (20)

QUESTION 1.2

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<tr>
<td>1.2.4</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>1.2.5</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

(5 x 2) (10)

QUESTION 1.3

1.3.1 Vitamin D/Calciferol ✓ ✓
1.3.2 Papillae ✓ ✓
1.3.3 Pelleting/granulation ✓ ✓
1.3.4 Pistolette/insemination gun/pipette ✓ ✓
1.3.5 Isolation/quarantine/separation/removal ✓ ✓

(5 x 2) (10)

QUESTION 1.4

1.4.1 rumen/forestomachs/reticulum/reticulo-rumen/large stomach ✓
1.4.2 maintenance ✓
1.4.3 di-oestrus ✓
1.4.4 antibodies/immunoglobulin ✓
1.4.5 anaemia ✓

(5 x 1) (5)

TOTAL SECTION A: 45
SECTION B

QUESTION 2: ANIMAL NUTRITION

2.1 The digestive system of ruminants

2.1.1 THREE labelled parts
A /reticulum/honeycomb/net stomach✓
B /rumen/large stomach✓
F/omasum/leaf stomach✓

2.1.2 TWO ideal conditions for microbial activity
• suitable/optimal/moderate/favourable temperature/ ≤ 38 °C to 42 °C✓
• sufficient mineral nutrients/phosphorus/cobalt✓
• sufficient nitrogen✓
• easily digestible carbohydrates✓
• a slightly acid medium/suitable pH(5,5 to 6,5)✓
• moist✓
• anaerobic✓
• regular intake of food/nutrients✓
• removal of waste products✓

2.1.3 TWO functions of micro-organisms in the digestive system of ruminants
• digest cellulose/crude fibre into volatile fatty acids and gases✓
• synthesise amino acids from any nitrogenous substances/source✓
• hydrolyse proteins from the feed to form amino acids✓
• synthesis of vitamins(vitamin K and B-complex)✓

2.1.4 A reason for enzymatic digestion in stomach
Secretes digestive (gastric) juice✓✓
OR
Secretes enzymes responsible for enzymatic digestion✓✓

2.1.5 Adapted part in a fowl
Proventriculus/glandular stomach✓

2.2 Cross section of a villus

2.2.1 Small intestines/duodenum/ileum/jejunum✓

2.2.2 Main nutrients absorbed
A – absorption of digested carbohydrates/glucose/digested proteins/amino acids/vitamins/minerals✓
B – absorption of digested fats/fatty acids/glycerol✓
2.2.3 **Suitability of villus for its function**
- The villus has numerous microvilli that increase the absorption surface/large surface area.
- It also contains blood capillaries and the lacteal for absorption of digested nutrients.
- It allows constant mixing motion necessary for absorption.
- It has a single layer of epithelial tissue.

(Any 2) (2)

2.3 **Supplements**

2.3.1 **Season for supplementing and reason**
- Winter/dry season.
- Green fodder (grass) that contain pigment (carotene) that can be transformed to vitamin A is not available in winter/dry season hence it is advisable to supplement this vitamin during winter.

(2)

2.3.2 **TWO methods of supplementing**
- Injection.
- Dosing/drenching.
- Feed concentrates/rations.
- Drinking water.
- Mineral licks.

(Any 2) (2)

2.4 **Digestibility coefficient**

2.4.1 \[
\text{Dry material intake (kg)} - \frac{\text{Dry material of manure (kg)}}{\text{Dry material intake (kg)}} \times \frac{100}{1}
\]

= \(\frac{(30 \text{ kg} - 10/100 \times 30 \text{ kg})}{(30 \text{ kg} - 10/100 \times 30 \text{ kg})} \times \frac{100}{1}
\]

OR

= \(\frac{27 \text{ kg} - 10.4 \text{ kg}}{27 \text{ kg}} \times \frac{100}{1}
\]

OR

= \(\frac{16.6 \text{ kg}}{27 \text{ kg}} \times \frac{100}{1}
\]

= 61.48% or 61.5% or 61.5% (Any 5) (5)

2.4.2 **Factor determining digestibility**
The higher the quantity/volume of feed taken in, the lesser the time for digestion/the lower the digestibility/less time of contact with digestive enzymes.

(2)

2.5 **Nutritive ratio**

2.5.1 \(75\% - 20\% = 55\%\) (1)
2.5.2 \[ NR = \frac{1 \times \text{% digestible non-nitrogen substances}}{\text{% digestible protein}} \]

1: \[ \frac{75\% - 20\%}{20\%} \] or
2: \[ \frac{55\%}{20\%} \]

1 : 2,75 or 1 : 3

(2)

2.6 Pearson square

2.6.1 Feed A: 14 5

\[
\begin{array}{c}
  \text{Feed B:} \\
  \text{21} \\
  \text{2}
\end{array}
\]

Mix 5 parts of feed A with 2 parts of feed B or 5 : 2

(3)

2.6.2 Feed B = \[ \frac{2 \times 100}{7} \frac{1}{1} \] = 28,57% or 28,6% or 29%

(3) [35]

QUESTION 3: ANIMAL PRODUCTION

3.1 Animal shelter

3.1.1 Production system

- Extensive farming

Reason

- Exposure to adverse weather conditions (cold, wet and windy)

OR

- Farmers did not have shelter for Angora goats and were subsidised to build one

(3)

3.1.2 Reasons for the recommendations by the extension officer for the production system

(a) Shelter

- Has sides for protection against cold winds/will reduce the wind chill
- Has a roof for protection against rain
- Has an enclosed area that keeps heat within/insulation

(Any 1) (2)
(b) Insulation material
- Heat can be retained/protection against bitter cold ✓ for a longer period of time ✓ (2)

(c) Heaters
Assist in increasing ✓ and maintaining/regulating temperature/reduce temperature fluctuations ✓ (2)

3.1.3 Reasons for the government grant/funding
- Help the farmers to build/purchase high tech equipment ✓
- To prevent job losses on the farms ✓
- To ensure that foreign exchange is earned/economic stability ✓
- To prevent shortage/losses of meat and mohair/to ensure sustainability ✓ (Any 2) (2)

3.2 Farm animals and products

3.2.1 TWO primary products of farm animals
- Milk ✓
- Meat (beef/fish/pork/bacon/chicken/mutton) ✓
- Eggs ✓
- Honey ✓
- Wool ✓
- Hides ✓ (Any 2) (2)

3.2.2 Optimising poultry production
(a) Space requirements
- Not overcrowded/enough space/eliminate competition ✓
- Housing/production system ✓
- Sufficient light ✓
- Fresh air/good ventilation ✓
- Cleanliness ✓
- Constant optimal temperature ✓ (Any 2) (2)

(b) Feeding facilities
- Functional feeding facility/allows for easy feeding/refilling ✓
- Provision of clean water and feeds/access to water ✓
- Feed accessible to animal/easy for animal to reach feed ✓
- Limits wastage ✓ (Any 2) (2)

3.2.3 Handling
- Farm animal B – Bigger/higher gates and fences/sides ✓
- These facilities are more expensive ✓
- More sophisticated handling facilities required/stronger structures needed (cables/bigger poles/pipes) ✓ (Any 2)
- Farm animal D – small/less structures needed/easier to handle ✓
  Structures not so high/not so strong/normal fences ✓ (Any 2) (4)
3.3 Animal behaviour

3.3.1 TWO behavioural patterns of cattle
- Nervous ✓
- Wild/aggressive ✓
- Stressed ✓

(Any 2) (2)

3.3.2 TWO economic benefits of good cattle management
- Better performance/production (better feed conversion ratio) ✓
- Improved reproduction rate ✓
- Improved health condition ✓
- Improved growth rate ✓
- Good quality carcass/milk/hides ✓

(Any 2) (2)

3.4 Animal fat content research

3.4.1
- Improve the carcass quality ✓
- Higher prices for their product/higher income ✓
- Meat becomes lean/most consumers prefer lean meat (lean meat is healthier) ✓

(Any 2) (2)

3.4.2 Total fat content over a period of 50 years

<table>
<thead>
<tr>
<th>Time (years)</th>
<th>Total fat content (g/100 g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>30</td>
</tr>
<tr>
<td>1970</td>
<td>25</td>
</tr>
<tr>
<td>1980</td>
<td>20</td>
</tr>
<tr>
<td>1990</td>
<td>15</td>
</tr>
<tr>
<td>2000</td>
<td>10</td>
</tr>
<tr>
<td>2010</td>
<td>5</td>
</tr>
</tbody>
</table>

Marking graph with the following checklist:

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Yes: 1 Mark</th>
<th>No: 0 Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Line graph</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2. X-axis correctly labelled</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3. Y-axis correctly labelled</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4. Points are plotted correctly</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5. Correct heading</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6. Units are indicated on both axes</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

(6)

3.4.3
- Fat content decreased ✓ ✓
- Fat content changed from 30 g/100 g to 5 g/100 g ✓ ✓
- An even decrease/rate of decrease was constant ✓ ✓

(Any 1) (2)
QUESTION 4: ANIMAL REPRODUCTION, PROTECTION AND CONTROL

4.1 Reproductive organs of a bull

4.1.1 Reproductive parts
A – Seminal vesicle/vesicular gland ✔
B – Prostate gland ✔
C – Cowper/bulbo-urethral gland ✔
H – Testis ✔

4.1.2 Process that occurs in K
Spermatogenesis/ sperm formation/gametogenesis ✔

4.1.3 Functions
D - Transports spermatozoa/enhances ejaculation ✔
L - Facilitates penetration of ovum/releases an enzyme (hyaluronidase) that allows spermatozoa to penetrate the ovum/acrosome reaction ✔

4.1.4 Influence of congenital defects
• Negatively affects sperm formation/spermatogenesis/ will not allow optimum spermatogenesis to take place/sperm defects ✔✔

4.1.5 Reason for part H to be situated outside the abdominal cavity
Sperm production occurs at the temperature slightly (1 to 3°C) lower than that of the body/to regulate the temperature for more effective spermatogenesis ✔

4.2 Progesterone and oestrogen

4.2.1 Day 7 ✔ & day 17 ✔

4.2.2 30 – 33 units ✔

4.2.3 Progesterone
Sharp increase in the level of progesterone ✔
Sharp decrease in levels of oestrogen ✔
4.2.4 **TWO effects of oestrogen on the animal at peak period**
- Thickens the lining of the uterus prepares the uterus for the implantation of the fertilised ovum/increases blood supply to the uterus ✓
- Relaxes the muscles of the cervix ✓
- Delays the secretion of FSH at the end of oestrus ✓
- Stimulates the gland in the brain to release LH ✓
- Stimulates the process of ovulation through the release of LH ✓
- Leads to the display of signs of oestrus ✓
- Prevents bacterial infection of the uterus ✓

(Any 2) (2)

4.2.5 The corpus luteum will degenerate/burst/be resorbed/be broken down ✓

(1)

4.3 **Ticks as animal parasites**

4.3.1 **TWO economic significance of ticks**
- Transmit diseases/entry point of pathogens ✓
- Production losses/skin damage ✓
- Underperformance of farm animals ✓
- Loss of teat function/ear lobes/tail tips ✓
- Death of farm animals ✓

(Any 2) (2)

4.3.2 Three-host tick ✓
Reason: Completes every stage of its life cycle on three different hosts ✓

(2)

4.3.3 **Reason for tick outbreak in the coastal region**
Humid ✓ and favourable climatic conditions ✓

(2)

4.3.4 **Fly specie attacking sheep**
- Blowfly ✓

(1)

4.3.5 **Biological ways of controlling ticks**
- Providing herbs ✓
- Use of natural enemies/predators (ox-pecker) ✓
- Breeding adaptable animals ✓

(Any 2) (2)

4.4 **Sheep vaccination plan**

4.4.1 Weaners ✓

(1)

4.4.2 3–5 months ✓

(1)

4.4.3 Protects the ewes at critical and delicate stage of gestation ✓ against the enzootic abortion ✓

(2)
4.4.4 Role of the state

(a) Quarantine services:
- To prevent diseases or pests being brought into the country ✓
- Strict import control measures are adopted/impose control measures on proclaimed diseases/ use law enforcement agencies (statutory measures, state vets stock inspectors) to control the movement of animals ✓ (2)

(b) Veterinary research:
- To develop better methods to diagnose and control diseases ✓
- Train veterinarians ✓
- Operate research stations ✓
- Stock inspectors ✓
- Extension services ✓ (Any 2) (2) [35]

TOTAL SECTION B: 105
GRAND TOTAL: 150
MARKS: 150
TIME: 2½ hours

This question paper consists of 17 pages and an 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 that you answer what is asked.

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

7. Write your centre number and examination number on the ANSWER SHEET. Place the ANSWER SHEET for SECTION A (QUESTION 1) in the front of 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 ... is the formation of prices of products and services in the market by the spontaneous operation of price-forming factors.

A Price elasticity
B Demand
C Supply
D Price determination

1.1.2 A process whereby agricultural products are changed into more useful tailor-made forms to meet consumer requirements, for example raw cotton into thread and cotton wool:

A Packaging
B Processing
C Standardisation
D Grading

1.1.3 Uncontrollable conditions such as drought, hail and pests that can have huge negative effects on the quantity of products that is actually produced compared to that which was predicted:

A Large volume in relation to value
B Seasonal fluctuation in production
C Competition
D Storage

1.1.4 Producers that form a formal group to market their products and who are paid the average price obtained for any specific year are following ...

A a niche marketing approach.
B a free marketing system.
C farm gate marketing.
D a pool system.
1.1.5 A farm financial planning aspect which is necessary to ensure that money required to keep the production process going is available at all times is called ...

A income tax.  
B insurance.  
C cash flow.  
D state duty.

1.1.6 An enterprise expense that constitutes that portion of the total cost which remains unchanged for a specific production enterprise regardless of whether more or less is produced:

A Demand costs  
B Fixed costs  
C Supply costs  
D Variable costs

1.1.7 The farm management principle which involves the checking and verification of the results of decision making is known as ...

A motivation.  
B coordination.  
C organisation.  
D control.

1.1.8 An action to address the problem of under-capitalisation of a farm:

A Working longer hours  
B Paying higher wages  
C Hiring farm machinery  
D Increasing the number of labourers
1.1.9 The following crossing between a recessive white cow (aa) and a dominant black bull (AA) resulted in only black offspring in the F\textsubscript{1} generation. In the F\textsubscript{2} generation, when inbreeding is practised, it will result in ... offspring.

A. all black  
B. three black and one white  
C. 50% black  
D. 75% white

1.1.10 The sudden appearance of a red calf in a herd of pure-bred black Drakensberg cattle, is due to ...

A. atavism.  
B. variation.  
C. hybridism.  
D. a nutritional deficiency.  

(10 x 2)  (20)
1.2 Choose a term 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) on the attached ANSWER SHEET, 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 Add to the marketing costs of agricultural products</td>
<td>A Skills Development Act, 1998</td>
</tr>
<tr>
<td>1.2.2 Medium-term capital item</td>
<td>B Labour Relations Act, 1995</td>
</tr>
<tr>
<td>1.2.3 Promulgated to provide for the training needs of farm workers as well</td>
<td>C homozygous</td>
</tr>
<tr>
<td>1.2.4 An individual with two different alleles of the same gene</td>
<td>D heterozygous</td>
</tr>
<tr>
<td>1.2.5 The use of livestock for breeding based on the quality of the animal’s ancestors</td>
<td>E producers</td>
</tr>
<tr>
<td></td>
<td>F intermediaries</td>
</tr>
<tr>
<td></td>
<td>G land</td>
</tr>
<tr>
<td></td>
<td>H machinery</td>
</tr>
<tr>
<td></td>
<td>I mass selection</td>
</tr>
<tr>
<td></td>
<td>J pedigree selection</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) on the attached ANSWER SHEET.

1.3.1 More production enterprises are included in a farming operation to improve sales and seasonal volumes

1.3.2 The provision of standard specifications which will give uniformity to a group of products regarding factors such as quality, size, mass, colour and moisture

1.3.3 A mechanism used by a farmer to provide financial protection against unforeseen events such as flooding, fires, et cetera

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

1.3.5 The spontaneous changes in the DNA structure that may be forced by exposure to certain chemicals or radiation resulting in new unique individuals

(5 x 2) (10)
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 In a **cooperative** marketing system, producers are encouraged to produce the highest quality products because their products compete with other producers with similar products.

1.4.2 Supply and demand are the two factors that are used when establishing the **value** of an agricultural product.

1.4.3 **Casual** labourers are employed on the farm on a long-term basis and enjoy benefits like adequate housing and medical aid.

1.4.4 **Epistasis** is a large group of genes that each add to the value of certain phenotypic characteristics.

1.4.5 **Spontaneous** variation is a complete range of variations of the characteristics from one extreme to another. 

(5 x 1) (5)

TOTAL SECTION A: 45
SECTION B

Start this question on a NEW page.

QUESTION 2: AGRICULTURAL MANAGEMENT

2.1 Farmers who intend running successful poultry farming businesses, should first conduct a market survey to ensure that all their produce will be sold. The production should also be monitored daily to enable them to see clearly whether they are achieving their objectives or not.

2.1.1 Name FOUR important marketing elements that a farmer needs to combine to develop a marketing strategy. (4)

2.1.2 Identify FOUR agricultural management concepts that could be linked to aspects mentioned in the passage above. (4)

2.1.3 Indicate THREE characteristics of a successful entrepreneur that could be gathered from the data supplied above. (3)

2.2 A business plan is a plan of action that an entrepreneur has for the business.

2.2.1 Before you start a business there are usually three questions that you have to ask yourself to decide whether your business idea is feasible or not.

Write down TWO such questions to support this statement. (2)

2.2.2 List the FOUR main items that should be included in a good business plan. (4)

2.2.3 Briefly discuss the main reason for including a business plan when applying for a loan at a financial institution. (2)
2.3 The picture below shows a street vendor selling agricultural products.

2.3.1 Identify the marketing system illustrated in the picture above. Motivate your answer. (2)

2.3.2 The marketing system above is exposed to some risks. State TWO possible risks of this type of marketing system. (2)

2.3.3 State the THREE main disadvantages of the marketing system above. (3)
2.4 The graph below shows the changes in the price as the equilibrium of supply changes.

2.4.1 Indicate the equilibrium price when the quantity supplied was 400. (1)

2.4.2 In summer the supply of fruit increases because most fruit are seasonal. Motivate the statement by referring to the data supplied above. (3)

2.4.3 Briefly explain the inelasticity of the supply of agricultural products in the short term. (2)

2.4.4 Discuss how processing can stabilise the income of a farmer. (3) [35]
QUESTION 3: PRODUCTION FACTORS AND MANAGEMENT

3.1 Judas is a grain farmer who secured 40 ha of commercial land through a lease arrangement with the local tribe authority. After matric Judas joined his father on a small community plot where they produced vegetables. Because they did not have a decent market to sell their produce, Judas took a break and enrolled in a panel-beating course. He then landed a job in the motor industry.

In 2004 he resigned from the motor industry and used his savings to buy a tractor and a planter. Instead of borrowing money from the bank, he raised money by hiring out his equipment to other small-scale farmers in the village. He grows sunflower on his land. He rests his soil for several months after harvesting.

[Adapted from Farmer’s Weekly, 29 April 2011]

3.1.1 Identify THREE production factors in the case study. (3)

3.1.2 Tabulate the THREE forms of assets in the case study and group them according to their lifespan as short-term, medium-term and long-term assets. (3)

3.1.3 Use the case study above and deduce a problem related to capital from the data and show how the problem was avoided by the farmer. (2)

3.1.4 Indicate TWO ways that Judas used to create capital for his farming enterprise. (2)
3.2 The illustration below shows a farm owner busy with management tasks.

3.2.1 Identify a production factor that is represented by the farm owner in the illustration above. Motivate your answer. (2)

3.2.2 State TWO ways to improve the productivity of land as a production factor. (2)

3.2.3 Explain how efficient planning by a farm manager can improve the working conditions of farm labourers with reference to the following:

(a) Day-to-day planning (2)

(b) Efficient mechanisation (2)

3.2.4 Suggest TWO strategies that a farm manager can apply to ensure that his farm labourers become aware of the impact of HIV/AIDS on their health. (2)
3.3 The table below shows the financial data of an agricultural production enterprise. The financial data is from January to April 2009.

<table>
<thead>
<tr>
<th>ASSETS</th>
<th>VALUE (R)</th>
<th>LIABILITIES</th>
<th>VALUE (R)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current assets</td>
<td>95 000</td>
<td>Current liabilities</td>
<td>33 600</td>
</tr>
<tr>
<td>Medium-term assets</td>
<td>58 000</td>
<td>Medium-term liabilities</td>
<td>15 000</td>
</tr>
<tr>
<td>Long-term assets</td>
<td>34 300</td>
<td>Long-term liabilities</td>
<td>48 000</td>
</tr>
<tr>
<td><strong>TOTAL ASSETS</strong></td>
<td><strong>187 300</strong></td>
<td><strong>TOTAL LIABILITIES</strong></td>
<td><strong>96 600</strong></td>
</tr>
</tbody>
</table>

3.3.1 Identify the type of financial statement given above. (1)

3.3.2 Explain the main purpose of the type of financial statement mentioned in QUESTION 3.3.1. (2)

3.3.3 Define the term *net value*. (2)

3.3.4 Calculate the net value from the data in the table above. (2)

3.3.5 If a farmer needs to expand a production unit, the farmer needs a loan or a grant. Distinguish between a *loan* and a *grant*. (4)

3.4 The graphs (GRAPH A and GRAPH B) below show two farms in the same farming district that have been managed differently over a period of 30 years. The farm CONCORDIA has been overgrazed for many years and erosion is visible, while the farm POLANI has never been stocked above the grazing capacity for that stock-producing area.

3.4.1 Name the farm that is represented by GRAPH B. Give a reason to support your answer. (2)

3.4.2 Indicate TWO possible causes of the decrease in production output in GRAPH A by referring to the data above. (2)
QUESTION 4: BASIC AGRICULTURAL GENETICS

4.1 A group of Grade 12 learners carried out a survey on genetically modified (GM) foods by distributing a questionnaire to 60 people. They wanted to investigate the value of GM foods compared to the value of normal foods and create awareness of any dangers of GM foods.

The survey only focused on two statements, which were formulated as follows:

1. The genetic make-up of all GM foods does not contain genetic material of any other organisms.
2. GM foods do not affect the health of people consuming these foods at all.

The results from the survey are shown in the bar graph below.

4.1.1 From the data above, calculate, as a percentage, the response rate of people who participated in the survey (respondents) compared to the number of people who received a questionnaire.

4.1.2 From the survey above, deduce a statement that was mainly aimed at each of the following aspects:

(a) The dangers of GM foods
(b) Knowledge of GM foods

4.1.3 Refer to the graph above and summarise the results of the survey conducted on genetically modified foods.

4.1.4 State TWO potential benefits of genetic modification for food production.
4.2 The table below shows the results obtained by crossing a pure-bred black-furred goat with a brown-furred goat. The allele for black fur (B) is dominant over the allele for brown fur (b). The offspring of the parents (F₁ generation) were used as parents (consisting of 4 breeding pairs) for the F₂ generation.

<table>
<thead>
<tr>
<th></th>
<th>NUMBER OF BLACK GOATS</th>
<th>NUMBER OF BROWN GOATS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parents</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>F₁ generation</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>F₂ generation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offspring of 1ˢᵗ breeding pair</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Offspring of 2ⁿᵈ breeding pair</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>Offspring of 3ʳᵈ breeding pair</td>
<td>5</td>
<td>3</td>
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<td>Offspring of 4ᵗʰ breeding pair</td>
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4.2.1 From the data above, determine the phenotypic ratio of the goats with black fur and the goats with brown fur in the F₂ generation. (2)

4.2.2 Draw a Punnet square to show the genotypic ratio of the offspring (F₂-generation) by using the genotypes of the F₁-generation parents. (3)

4.2.3 Determine the phenotypic ratio of the offspring (F₂ generation) mentioned in QUESTION 4.2.2. (2)

4.3 Variation is important to farmers because it is the foundation of natural breeding programmes. A farmer would prefer to have animals that are ideally suited to the specific agricultural production environment. Sheep kept in the harsh semi-desert area of the Karoo have been selected by nature through droughts and other harsh environmental factors. Only the more adapted animals and their offspring manage to survive.

4.3.1 Identify the process of selection referred to in the passage above. (1)

4.3.2 Name the TWO most important uses of variation in breeding. (2)

4.3.3 Describe how the heritability of characteristics will influence the success of a breeding programme. (2)

4.3.4 An index value gives the average for a characteristic calculated as a value of 100. Briefly explain how a farmer should use such an index value to select animals for the herd. (2)
4.4 The diagram below shows the cloning of a sheep named Dolly.

**HOW DOLLY WAS CLONED**

1. A body cell is removed from the donor sheep.
2. The body cell nucleus is removed.
3. The nucleus of an egg cell from a second sheep is removed and thrown away.
4. The body cell nucleus is inserted into the egg cell.
5. The embryo is cultured.
6. The embryo is implanted into the womb of another sheep.
7. Dolly is born, a clone of the first donor sheep.

4.4.1 Give the reason for removing the nucleus from the egg cell of the second donor before the sheep could be cloned. (2)

4.4.2 The step marked 5 in the diagram above states that 'the embryo is cultured'. Indicate the process of cell division through which the embryo develops. (1)

4.4.3 Explain why it is impossible for Dolly to have any characteristics of the second donor sheep. (2)

4.4.4 Briefly discuss TWO advantages of cloning for the agricultural livestock industry. (2)
4.5 When snapdragon plants with red flowers (F<sup>R</sup>F<sup>R</sup>) are crossed with snapdragon plants with white flowers (F<sup>W</sup>F<sup>W</sup>), the F<sub>1</sub> generation is heterozygous (F<sup>R</sup>F<sup>W</sup>) and all have pink flowers. It appears that neither the red nor the white allele is dominant.

4.5.1 Identify the type of dominance illustrated in the diagram above. (1)

4.5.2 Complete the diagram by inserting the labels of the genotypes represented by A, B and C. (3)

4.5.3 Determine the phenotypic ratio for the F<sub>2</sub> generation. (2)

[35]

TOTAL SECTION B: 105
GRAND TOTAL: 150
## SECTION A

### QUESTION 1.1

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(10 x 2) (20)

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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