



**SUBJECT: SUBJECT NAME**

**GRADE 12**

**2025 LAST PUSH**

**TEACHER AND LEARNER CONTENT MANUAL MEMO**

**1.1 Farm animal represented by the alimentary canal**

Pig ✓ (1)

**1.2 Importance of parts A and C**

A – Assists in chemical digestion of food ✓ (1)

C – Assists in chemical digestion and absorption of food ✓ (1)

**1.3 Explanation of mechanical digestion**

Breaking down of the complex food particles into smaller, simpler particles through physical objects/teeth ✓✓

**QUESTION 2**

**2.1 Letter of the structure of cellulose digestion**

A (1)

## 2.2 Cellulose digesting enzyme

Cellulase ✓ (1)

## 2.3 TWO requirements of the organisms in part A

- Easily digestible carbohydrates ✓
- Regular intake of food for fermentation ✓
- Sufficient mineral nutrients (Na/Cu/Co/P) ✓
- Anaerobic/oxygen free environment ✓
- Presence of CO<sub>2</sub> ✓
- Sufficient nitrogen ✓
- Suitable pH/slightly acidic pH/pH of 5,5 to 6,5 ✓
- Warm environment/temperature of 38-42°C ✓
- Continual elimination of end products ✓
- Osmotic condition/moist environment ✓ (Any 2) (2)

## 2.4 The type of digestion in part D

Chemical/enzymatic digestion ✓ (1)

## 2.5 Reason for the answer

Part D secretes digestive juices/enzymes  
(1)

## QUESTION 3

### 3 An alimentary canal of a farm animal

#### 3.1 Classification of the animal alimentary canals

Non-ruminant ✓ (1)

#### 3.2 Reason visible from the diagram

It has a simple/single/monogastric stomach ✓  
(1)

### 3.3 TWO functions of the digestive juice in A

- Changes the pH from acid to alkaline/helps to neutralize the acid from the gastric juices ✓
- Increases the solubility of fats ✓
- Emulsification of fats ✓
- Promotes the absorption of fatty acids and glycerol
- Assists with the absorption of fat- soluble vitamins
- Acts as an antiseptic ✓
- Acts as a detoxifying agent ✓
- Activates lipase ✓
- Lubrication of the alimentary canal ✓
- Enhances peristalsis ✓

(Any 2) (2)

### 3.4 Enzym3.4 Enzyme digesting fats

A: Ruminants ✓

: Non-ruminants

(1)

### 4.2 Identification of letters

E: Crop ✓

(1)

J: Oesophagus ✓

(1)

### 4.3 Identification of the alimentary canal of a young ruminant

DIAGRAM C

(1)

### 4.4 Justification

- Very large abomasum compared to rumen ✓
- Presence of oesophageal groove ✓
- Under-development of fore stomach ✓

(Any 1 x 1)

(1)

### 4.5 Identification of the letters:

- (a) H ✓ (1)
- (b) F ✓ (1)
- (c) A ✓ (1)

## 1.2 Activities

1

### 1.1 Classification of FEED A and FEED C

Feed A - Concentrate ✓ (1)

Feed C - Roughage ✓ (1)

### 1.2 Letters recommended for each situation

(a) B ✓ (1)

(b) D ✓ (1)

(c) A ✓ (1)

(d) C ✓ (1)

### 1.3 Justification of better digestion of feed B

Ground feed/maize has smaller particles with an increased surface area for more exposure to enzymes ü and better digestion✓✓ (2)

## 2.1 Identification of the feed

(a) Carbohydrate-rich roughage: Oats hay ✓ (1)

(b) Protein-rich concentrate: Sunflower oil cake meal ✓ (1)

### 2.2 Explanation for not recommending the ration as the only source of food for lambs

- Rumen of the lamb is still underdeveloped/abomasum is the only functioning compartment that cannot digest crude fibre
- Cannot digest feed with a high crude fibre content/roughage is too high/70% (2)

### 2.3 Importance of grass hay in rations for mature ewes

- Grass hay is cheap and available ✓
- To improve functioning of the digestive system ✓

- Prevents bloating ✓
  - Supply the necessary bulkiness to the ration/main source of the ration ✓
  - Source of energy ✓
- (Any 1) (1)

### QUESTION THREE

#### 3.1 Classification of feed types

A - Concentrates ✓ (1)

B - Roughages ✓ (1)

#### 3.2 Group of feed type C

Protein rich feeds (1)

#### 3.3 TWO examples of feed type D

- Maize meal ✓
  - Oats meal ✓
  - Barley meal ✓
  - Sorghum meal ✓
  - Rye meal ✓
  - Wheat meal ✓
- (Any 2) (2)

#### 3.4 Justification of feeding feeds labelled B to ruminants

- Roughages help to prevent bloating ✓
- Supply the necessary bulkiness of their ration ✓
- Enhance rumen development and functioning ✓

3.1 Energy loss in manure if the farm animal consuming 5kg of feed

42,5J (1)

#### 3.2 Identification of the gas with the highest energy loss

Methane (1)

#### 3.3 Calculation of the energy available for growth and production

NE = GE – (energy lost in manure + in urine + as heat + methane)

= 18,5J – 14J/(8,5J + 1,2J + 1,8J + 2,5J)

NE = 4,5 J (3)

4

#### **4.1 Feed nutrient supplying most energy**

Fats (1)

#### **4.2 Units of measuring energy**

Mega joule/MJ/kilojoule/kJ/Joule/J (1)

#### **4.3 TWO reasons for calculating energy value of feeds to a farmer**

- To determine the feeding standards
- To be able to provide a recommended diet
- Helps in the formulation of rations (Any 2) (2)

(4

#### **5.2 Feed for fattening animals with reason**

Feed A (1)

##### **Reason**

NR is wide/(1:9)

Higher ratio of carbohydrates to protein

As carbohydrates are necessary for fattening (Any 2)(2)

#### **5.3 Feed suited for young growing animals**

Feed B (1)

##### **Reason**

NR is narrow/(1:5)

Higher ratio protein to carbohydrates

As protein is necessary for growth (Any 2)(2)

6

6.1

Feed B ✓ (1)

Feed A ✓

(1)

Feed C ✓

## QUESTION 7

### Pearson square

#### 7.1.1. Parts representing

(a) Soya bean oilcake meal - (✓1)

(b) Oat meal - 29 ✓ (1)

#### 7.1.2 Calculation of the percentage oatmeal in the mixture

$$\square 29+6 = 35 \text{ parts } \square \square$$

$$\frac{29}{35} \times \frac{100}{1} \square$$

$$\square = 82,86\% \square$$

(3)

## QUESTION 8

### NUTRITIVE RATIO

#### 8.1.1 Calculation of nutritive ratio of feed B

$$\text{NR} = 1: \frac{\% \text{TDN} - \% \text{DP}}{\% \text{DP}} \checkmark$$

$$= \frac{80 - 7}{7} \checkmark$$

$$= 1: 10.42 \checkmark$$

## 8.1.2 Feed for growing animals

Feed A is suitable for growing animals ✓

### Justification

Feed A has narrow nutritive ratio/NR= 1:4 ✓

## QUESTION 9

### Components of feed

#### 9.1.1 TWO roles of water/moisture in digestion

Acts as a solvent for dissolving substances in the body ✓

Softens/moistens food ✓

Facilitating enzymatic digestion ✓

Medium through which waste products are excreted

Transports nutrients through the digestive tract ✓

Any 2 (2)

#### 9.1.2 Identification of the component

(a) Zinc ✓ (1)

(b) Vitamin K ✓ (1)

(c) Phosphorus ✓ (1)

#### 9.1.3 Indication of the component that is

(a) Fat soluble - Vitamin K ✓ (1)

(b) Water soluble - Vitamin B<sub>1</sub> ✓ (1)

#### 2.6.1 Definition of energy at A

Digestible energy is the gross energy minus energy lost in faeces ✓✓

(2)

#### 2.6.2 Label for B

Urine ✓

(1)



### 2.6.3 ONE function of E

For maintenance/production/reproduction/growth/work ✓ (1)

### 2.6.4 Calculation of C

$$\begin{aligned}\text{Metabolic energy} &= 37,2 \text{ MJ} - 9,8 \text{ MJ} - 4 \text{ MJ} \checkmark \\ &= 23,4 \text{ MJ} \checkmark\end{aligned}$$

## QUESTION 10

### Fodder flow programme

#### 10.1.1 Calculation of the quantity of feed required for the first six months of the year (in kg)

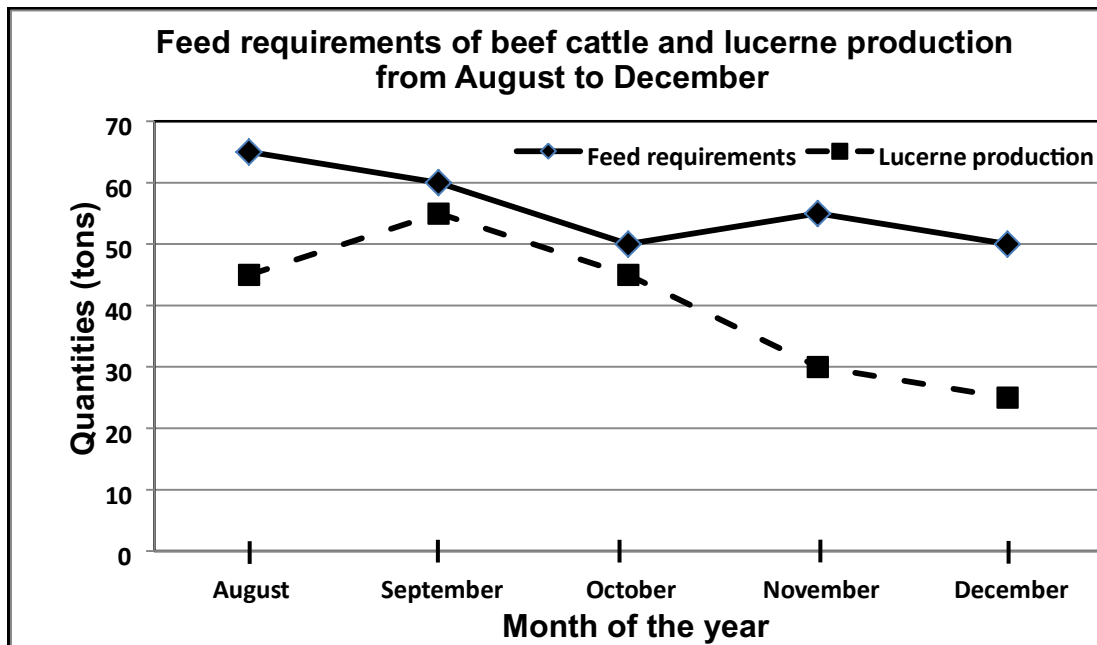
$$\begin{aligned}&50+50+50+50+55+60 \\ &= 315 \text{ tons} \checkmark \quad (1) \\ &315 \times 1\,000 \checkmark \quad (1) \\ &= 315\,000 \text{ kg} \checkmark \quad (1)\end{aligned}$$

*Please note: to covert tons to kilograms multiply the figure by 1000  
To convert kilograms to tons, divide the figure by 1000*

#### 10.1.2 TWO importance of fodder flow planning

- Safe use of resources ✓ (1)
- To meet the animals feed requirements/standards ✓ (1)
- Effective management of the fodder flow programme ✓ (1)
- To ensure a positive margin over feed costs✓  
(Any 2) (2)

### 10.1.3 Line graph



### CRITERIA/RUBRIC/MARKING GUIDELINES

Correct heading ☐

X-axis: correct calibrations and labelled (Month of the year)

Y-axis: correct calibrations and labelled Y(Quantities) ☐ ☐

Line graph ☐

Units (tons) ☐

Accuracy (80% + correctly plotted) ☐

(6)

## QUESTION 11

### 11.1.1 Definition of energy at A

Digestible energy is the gross energy minus energy lost in faeces ✓✓  
(2)

**11.1.2 Label for B**

Urine ✓ (1)

**11.1.3 ONE function of E**

For maintenance/production/reproduction/growth/work ✓ (1)

**11.1.4 Calculation of C**

Metabolic energy = 37,2 MJ – 9,8 MJ – 4 MJ ✓  
= 23,4 MJ ✓

**TOPIC 2 ANIMAL PRODUCTION**

**QUESTION 1**

**1.1.1 Identification of Pictures A and B**

A: Extensive ✓ (1)

B: Intensive ✓ (1)

**1.1.2 Differences between the production systems**

<b>A: Extensive</b>	<b>B: Intensive</b>
<ul style="list-style-type: none"> <li>• Depend mainly on natural resources / not fed with well formulated feed ✓</li> <li>• Not many capital inputs/not capital intensive ✓</li> <li>• Normally on a large piece of land ✓</li> <li>• Not labour intensive/few labourers ✓</li> </ul>	<ul style="list-style-type: none"> <li>• Animals are well taken care, carefully bred and closely supervised (optimal inputs and outputs)/technologically advanced systems utilised / well formulated feed ✓</li> <li>• Capital intensive / expensive infrastructure ✓</li> <li>• Relatively small area is utilised ✓</li> <li>• Very labour intensive ✓</li> </ul>

(Any 2)

(Any 2)

**1.1.3 Recommendation of a farming system**

A / sheep / cattle / game / goat farming in dry area / Pasture production ✓  
This farming enterprise is dependent on unpredictable climatic/ environmental conditions ✓

## QUESTION 2

2.1.1 **Identification of the production system in picture C**  
Backyard system/free range/semi-intensive (1)

2.1.2 **Reason**  

- Chickens move freely around the house during the day ☐
- Are kept inside the shelter
- Feed is provided (Any 2) (2)

2.1.3 **Indication of the letter of the picture**  
(a) Picture B (1)  
(b) Picture A (1)

2.1.4 **Differentiation between facilities in terms of their purpose**  

- **Facility in A** - Animals are kept for handling/management practices/auction/temporarily ☐ (1)
- **Facility in D** - Animals are kept for housing/feeding/growing/permanently (1)

2.1.5 **Role of equipment labelled E in picture D**  
For automatic dispensing of animal feed (1)

### 2.1.6 TWO basic guidelines for handling large farm animals

- Announce your approach through touch from the front/side ☐
- Avoid the blind spot ☐
- Avoid the kicking region when approaching animals ☐
- Use proper handling facilities/special facilities for male animals ☐
- Always leave yourself an escape way ☐
- Avoid entering small area enclosed with large animals ☐
- Never poke/prod/throw objects to animals ☐

- Give animals time to adjust before working with them□
- Take special care when working with cows that have calves□
- Avoid children/visitors/non-workers approaching animals□
- Limit/reduce noise levels□
- Handle animals in a group/herd□

(Any 2) (2)

### 3.1.1 Identification of a production system

Back yard/free-range/subsistence ü

(1)

### 3.1.2 THREE advantages of back yard system to rural communities

- Less expensive/cheaper ü
- Easy to manage ü
- No special equipment needed ü
- No specialised/expert knowledge needed ü
- More environmental friendly ü

(Any 3)

(3)

### 3.1.3 THREE problems of backyard system

- Easy to contact disease ü
- Poor feeding/feeding on less nutritious food ü
- High risk towards predators ü
- More feed energy is utilised for non-production purpose/low production output/slow growth rate ü
- High risk towards theft of animals ü
- Expose to extreme environmental conditions ü

(Any 3)

(3)

## QUESTION 4

### Activity 4

#### 4.1.1 Feedlot with highest cost

Nkomani feedlot ü

#### 4.1.2 Cost efficient feedlot

Sondela feedlot: ü

The total cost was the lowest (78 compared to 81) and ü

The production output was the highest (72 compared to 68) ü

**4.1.3 The most efficient way to improve**  
Genetic improvement and breeding ü

**4.1.4 One environmental factor influencing on production**

Climate conditions / Rainfall / Drought / Temperature / Light / Humidity / Wind /  
Nutrition / Slope / Topography / Feeding / Shelterü      Any 1      (1)

**4.1.5 One method to improve the genetic potential of animals**

A specialised breeding program / Inbreeding / Cross-breeding / AI /  
Embryo transplantation / Genetic engineering /  
Upgrading will increase the genetic potential of the herd /  
Buying of superior animals from selected breeders ü

**Activity 4**

**Question 5**

5.1.1      **Farming system by FARMER A**  
Farmer B ü      (1)

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

- 5.1.3      **Difference in feeding strategies**
- FARMER A is feeding livestock on natural pasture ü
  - FARMER B is feeding livestock through a feedlot ü

(2)

- 5.1.4      **TWO measures to increase production for FARMER A**
- Supplementary feeding/nutrition ü
  - Control adverse environmental conditions through shelter ü
  - Control of pests and diseases ü
  - Correct breeding methods ü

- More effective grazing system/rotational grazing ü (Any 2)  
2

## Activity 5

## Question 6

### 6.1 1 Production systems

Extensiveü (1)  
Intensive ü

(1)

6.1.2 Location ü  
Design · ü  
Type of animalü  
Material ü  
Layout ü  
(Any 3) 3

6.1.3 Breed tamenes· ü  
Type of animal breedü  
Age of animal ü  
Physiological and health status of animalü  
Frequency of handlingü  
Facilities and equipment usedü  
Prevailing environment ü

Any 2 2

6.4 Raised or pinned ears ü  
Ralsed tail ü  
Raised back hair ü  
Bared teeth ü  
Pawing the ground ü  
Snorting, ü  
Wild look in the eyes ü  
Screaming/be\lowing ü  
Fast movements/excessive ü  
Scratching with hooves on groundü  
Fast breathing rate ü  
Unfamiliar behavior ü

**QUESTION 7****7.1.1 Animal kept under intensive system**

sheepü

(1)

**7.1.2 Reason**

100 sheep are kept on a small area/ many sheep  
are kept on a on a small area. ü

(1)

**7.1.3 Identification of farm animals**

(a) poultryü

(1)

(b) (cattle/goat) ü

(1)

(c) sheep/goatsü

(1)

$$7.1.4 \quad 25 + 100 + 30 + 16 = 165\text{ü}$$

(1)

$$\frac{100 \times 100}{165} \text{ ü}$$

(1)

$$= \frac{10000}{165} = 60.60\% \text{ü}$$

(1)

**Activity 7****8.1.1 Identification of farming systems**

A Subsistence ü

(1)

B Commercial ü

(1)

**8.1.2 Comparing subsistence and commercial farming systems****(a) Purpose of the output****Subsistence** - Output is mainly for feeding the family/not for profit ü

(1)



(b) **Commercial** - Output is mainly for selling/profit ü

### **8.1.3 Impact on environment**

#### **Subsistence**

No/little impact as there is no pollution ü

(1)

**Commercial** - Huge impact because of high production of manure/higher rate of pollutionü

(1)

### **3.1.3 Disadvantage of farming system B**

Large scale spread of diseases/loss of productionü

(1)

### **8.1.4 Economic benefit of farming system B over A**

High production/income/profit for the farmer ü

(1)

### **8.1.3 THREE challenges associated with commercial beef farmers**

Drought/ Weather ü (1)

Disease managementü (1)

Fluctuations in priceü (1)

### **Activity 8**

#### **9.1.1 Handling facilities in an intensive production system**

#### **Identification of the**

**facilities A** Holding pen

(1)

**C** Crush

(1)

9.1.2 **Main purpose of a head clamp**  
To restrain/contain animals to stand still ☐

9.1.3 **TWO design features of a crush**

- Must be strong/durable ☐
- High/wide enough for specific type of animal ☐
- No sharp curves ☐
- Safe for animals/handlers ☐
- Clean ☐

(Any 2) (2)

## Activity 9

### 9.2.1 Matching equipment

- (a) C✓
- (b) D✓
- (c) A✓
- (d) E✓
- (e) B✓

(5)

### 9.2.2 TWO other reasons for handling animals

Transportation✓  
General examination✓  
Pregnancy diagnosis✓  
Weighing✓  
Control external parasites/dipping/foot bathing✓  
Age determination✓  
Dehorning✓  
Hoof trimming✓  
Artificial insemination✓  
Production purposes✓  
Slaughtering✓  
Selection✓  
Weaning✓  
Feeding✓  
Docking✓  
Evaluation and classification✓  
Generation of data✓

Any 2 (2)

### 9.3 Farm animals and behaviour

9.3.1 Cattle ✓

9.3.2 sheep ✓

9.3.3 pigs ✓

9.3.4 chicken/fowl/poultry ✓

#### Question 10.1.1 Five basis aspects to be considered

Do not combine young and old animals together ✓

The floor of the truck must not be slippery ✓

Obtain a movement permit/other relevant document ✓

Strong structures/enclosure ✓

Avoid overcrowding in the vehicle ✓

(5)

#### 10.1.2 Two tools to be used

Red flag ✓

(1)

### 10. 2.1 The tabulation of data

The table below shows the weight gain of lambs over a period of 40 days ✓

✓

Days	Weight gain ✓ (g) ✓
0	0
4	400
8	400
12	1 200
16	1 200
20	1 200 ✓
✓ 24	1 800
28	1 800
32	1 800
36	1 000
40	0

### Criteria/rubric/marking guidelines

- Correct heading ✓
- Correct labelling of days and weight gain ✓
- Populated table ✓
- Correct unit (g) ✓
- Correct reading of the days ✓
- Correct reading of the weight gain ✓

### **10.3. Structures and apparatus**

10.3.1 Fence✓

10.3.2 Crush✓

10.3.3 burdizzo✓

10.3.4 Shelter/building✓

#### **10.4.1 Identification of equipment**

Illustrator/ rubber ring ✓

#### **10.4.2 Use of equipment/tool**

Tail docking✓

Castration ✓

#### **10.4.3. Reason for equipment use**

##### **A Tail docking**

Hygienic purpose/prevention of blowflies ✓ (1)

For better reproduction ✓

(1)

Any 1 1

##### **B Castration**

- For better breeding purpose ✓

(1)

- All inferior males are castrated ✓  
(1)

Any 1 1

## QUESTION 11

### 11.1.1 Name of facility

crush ✓

### 11.1.2 Two measures to consider in crush design

It should have strong/high walls/solid sides to prevent animals from seeing out ✓

It must have narrow/single curves that are not sharp ✓

There should not be anything that can harm/hurt/cause injury to the animals ✓

### 11.1.3 Type of document

Permit ✓

### 11.1.4 Precautionary measures

Avoid overcrowding animals ✓

Calm animals before transportation ✓

### 11.2.1 Management practices

A Injection ✓

B Castration ✓

### 11.2.3 Mineral given

Iron/Fe ✓

### 11.2.4 Justification with TWO reasons

Sow milk contains a limited quantity of iron/not enough ✓

(1)

Most effective way to administer iron/Fe ✓

(1)

iron (1) Initial feed intake of piglets is low/inadequate to support their requirements ✓ (1)

Question 12 Naming of equipment

12.1.1 tatoo pliers

12.1.2 ear tag

12.1.3 smart neck band

12.1.4 branding iron

### Question 1

Testes ü (1)

Epididymis ü (1)

Oogenesis ü (1)

### Question 2

Spermatogenesis ü and Oogenesis ü (2)

### Question 3

Spermatogenesis produce sperm ü in the testes.ü

Oogenesis produce ovaü in the ovariesü (4)

### Question 4

1

A Oestrogen ü

C Progesterone ü (2)

4.2 Release of the ovum/egg cell ü from a mature Graafian follicle (2)

4.3

- Mounts other cows
- Restlessness
- Swelling of the vulva
- Excessive mucus secretion from the vulva ü
- Mucus membranes of the vagina appears red and moist ü
- Scratches, manure and mud on the rear end ü
- Allows mating ü

- Tail head is in a raised position ü
- Tail head and hair is fluffed up ü( Any 2) (2)

#### 4.4 Function of FSH

- Stimulates the formation of follicles ü
- Facilitates/stimulates growth/development and function of the Graafian follicle ü( Any 1) (1)

### Question 5

#### 5.1

- ANIMAL A - Oestrogen ü (1)
- ANIMAL B - Testosteroneü (1)

#### 5.2

- Oestrogen - Makes cow to come into oestrus/allow matingü (1)
- Testosterone - Stimulates mating behaviour in the bull ü (1)

#### 5.3

- (a) Fertilization/pregnancy/gestation ü (1)
- (b) Parturition/birth giving/calving ü (1)

#### 5.4 Oxytocin ü (1)

5.5 It causes contraction of the myoepithelial cells surrounding the alveoli to release the milk ü (1)

### Question 6

6.1 Identification of the hours after oestrus to get the highest



pregnancy rate 10 to 13 hours after onset of oestrus ü (1)

6.2 The cow will be receptive to the bull/it will be on heat/in oestrus ü (1)

6.3

Allows mating/insemination ü

Mucus strings from the vulva ü

Swollen and red vulvaü

Mounts others ü

Hair on the back/rump are fluffed up ü

Mud patches on her back ü

Bellowing noisesü

Cows are excited/restless ü

Frequent urination ü

Sniffs the genitals of other cows ü

Raises their heads and curls her lipsü

Decrease in milk production (Any 2) (2)

6.4

Ovum has a shorter lifespan than a sperm cell ü

Ovum needs to arrive when sperm cells are already waiting for fertilisation ü  
(Any 1) (1)

6.5

Use of healthy/viable semen ü

Technique performed by a skilled/experienced technician ü

Insemination at the correct stage of oestrus ü

Use the correct sterilised equipment (Any 1) (1)

### **Question 7**

#### **Correct technique for AI**

##### **7.1 Re-arranging the steps during AI**

- A cow is sheltered and kept calm □ ü
- Excess faecal matter is removed □ ü
- Inseminator checks abnormalities and whether the cow is not pregnant by inserting the hand through the rectum ü
- The pistolette is guided through the vulva, vagina to the cervix ü (4)

##### **7.2 TWO disadvantages of AI for the farmer**

- Disease transmission can affect large number of cows ü
- Infections can occur/venereal diseases can spread quickly ü
- Genetic abnormalities can occur ü
- Inexperienced operator can damage the reproductive organs ü
- Low success rate when using inexperienced technician ü
- Labour intensive ü
- Expensive ü
- More time consuming ü

- Not always successful ü
- Does not necessarily improve the genetics of the herdü
- Genetic variability can decrease ü
- If records are not kept carefully, inbreeding can occurü
- Undesirable traits can be transferred to more offspringü (Any 2) (2)

## Activity 1.2

### Question 1

1 Process generally used in the reproduction of farm animals

1.1 The process illustrated in the diagram

Nuclear transfer/cloningü (1)

1.2 Identification of the cells

A - Recipient cell with nucleus/egg cell/ovum ü (1)

B - The nucleus of the donor cell ü (1)

D - The fused cell ü (1)

1.3 TWO different types of the process

- Reproductive cloning ü

- Therapeutic cloning ü (2)

## Question 2

### 2.4 Apparatus used in the Artificial Insemination (AI) process

#### 2.1 Identification of the apparatus

A - Artificial vagina ü (1)

(1)

B - Pistolette ü

C - Nitrogen flask/canister/tank ü (1)

#### 2.2 Function of each apparatus

A - Collection of semen ü (1)

B - For the deposition of semen in the cow during AI ü (1)

C - Storage of semen for longer periodsü (1)

#### 2.3 TWO basic requirements for the collection of semen from bulls

- Should be close to a laboratory ü
- Equipment must be clean/sterilised ü
- Availability of appropriate equipment/artificial vagina ü

- Male animal must be clean/healthy ü
- Warm collecting vial/placed in a water bath/prevent temperature shock ü
- Personnel must be trained/experienced ü
- Floor not slippery ü
- Semen must be protected from direct sunlight ü
- Teaser cows' availability ü (Any 2) (2)

### **Question 3**

Synchronisation schedule of female animals

#### **3.1 Identification of the process**

Synchronisation of oestrusü

(1)

#### **3.2 TWO disadvantages of a synchronisation schedule in cattle**

- Poor nutrition/body condition/health will affect the process

Negatively ü

- Needs good/expensive facilities ü
- Labour/time intensive ü
- Involves skilled management and technologies ü(Any 2) (2)

#### **3.3 TWO techniques used in the synchronisation of female animals**

- Synthetic progesterone/progestin/oestradiol ü
- Co-Synch/gonadotropin/co-synch synchronisation ü
- Ear patches/implants ü

- Vaginal insurgents ü. (Any 2) (2)

3.4 Indication of the time (day) when the cows will be inseminated

Day 35 – 40ü

(1)

3.5 THREE causes for lack of libido

- Immaturity ü
- Inexperience ü
- Diseases ü
- Underfeeding/overfeeding/malnutrition ü
- Old age/senility ü
- Overwork/exhaustion/over exertionü
- Improper handling/stress ü
- Lack of testosterone ü
- Temperament ü
- Environment ü

(Any 3)

(3)

#### **Question 4**

4.1 Stage of pregnancy

Foetal stage ü

(1)

4.2 Indication of the letter of the membrane

(a) A ü

(b) B ü

(c) C ü

### **Question 5**

Parturition

5.1 TWO behavioural signs of an animal that is about to give birth

- Isolates herself from the herd ü
- Loss of appetite ü
- Show signs of distress and discomfortü
- Restlessness ü
- Nesting behaviour/circles searching for a hiding place ü
- Frequent urination ü
- Bellowing noises ü

(Any 2)

(2)

5.2 TWO causes of problems during birth in heifers

- Large foetus/small sized heifer ü
- Multiple births ü
- Inexperience ü
- Incorrect presentation ü
- Malformed foetus/hydrocephalous ü
- Size of the pelvic areaü
- Incomplete/failure of the cervix to dilate ü

- Prolonged parturition/ineffective/weak labourü
- Inertia of the uterus ü
- Torsion of the uterus ü
- Length of the gestation period ü
- Poor body conformation ü
- Malnutrition ü
- Diseases ü (Any 2) (2)

### **Question 6**

The importance of the aspects of embryo transfer

#### 6.1 Superovulation

To produce more genetically superior ovaü

(1)

#### 6.2 Embryo flushing

For the harvest of more embryos from superior/donor cows ü

(1)

#### 6.3 Donor cow

For the production of superior embryo's ü

(1)

#### 6.4 Recipient cow

For implantation of the harvested embryo's ü

(1)



## **PRODUCTION FACTORS**

### **QUESTION 1**

#### **1.1 Match the economic characteristics of land**

- 1.1.1 Durability ü (1)
- 1.1.2 Availability ü (1)
- 1.1.3 Indestructibility ü (1)

#### **1.2 Two groups of farmers**

##### **1.2.1 Factor of land addressed by the two scenarios**

Land availability/ area of production ü (1)

##### **1.2.2 TWO benefits of the practices by Group B contributing to higher production**

- Able to work on a large area faster ü
- Use of machinery is more effective ü
- More cost effective to produce ü
- Specialisation ü (Any 2) (2)

##### **3.1.3 TWO techniques for Group A that can improve production**

- Use of scientific methods/technology ü
- Consolidation of small units ü (2)

##### **3.1.4 Economic characteristic negatively affected by monoculture and continuous cultivation** Production potential of the land ü (1)

##### **3.1.5 TWO functions of land as a production factor**

- Provides food ü
- Provides raw materials ü
- Provides space ü
- Source of raw minerals ü (Any 2) (2)

## Question 2

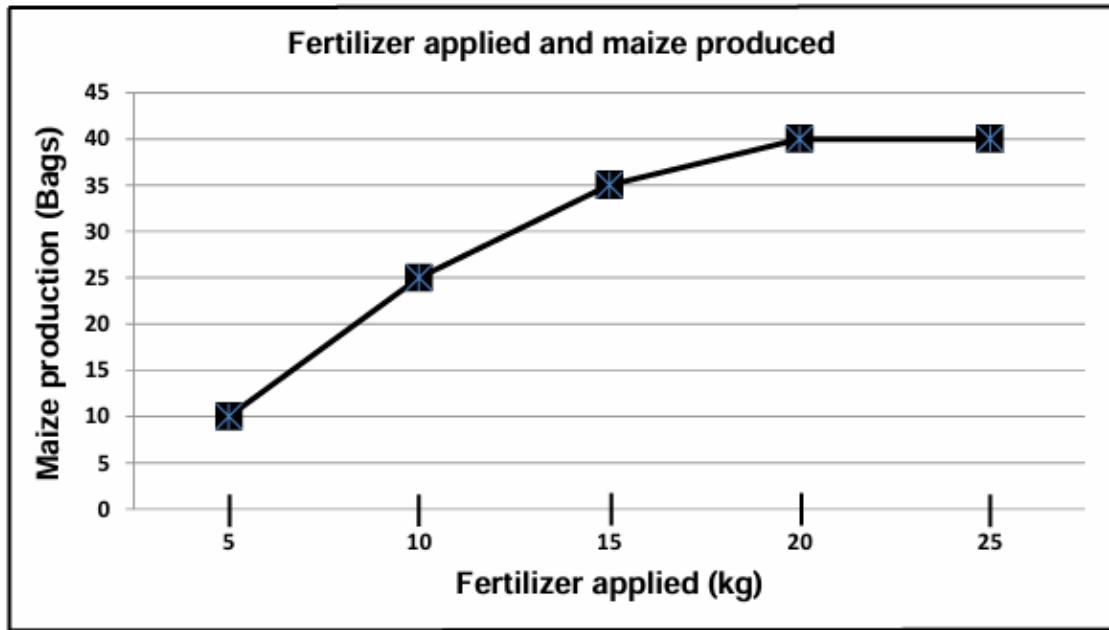
### 2.1 Meaning of the following economic characteristics of land

- (a) Industrial and residential areas reduce the amount of land available for agriculture ü (1)
- (b) The amount of land available for agriculture in a country does not increase√ (1)

- (c) The decrease in the marginal output of a production process as the amount of a single factor of production is incrementally increased, while the amount of all other factors of production remain constant. (2)

### 2.2 Land as a production factor

#### 2.2.1 Line graph



#### CRITERIA/RUBRIC/MARKING GUIDELINES

- Correct heading ✓
- X-axis: Correctly calibrated and labelled (Fertilizer) ✓
- Y-axis: Correctly calibrated and labelled (Maize production) ✓
- Correct units (Bags and kg) ✓
- Line graph ✓
- Accuracy (80% + correct plotting) ✓

#### 2.2.2 Economic characteristic of land

Land is subject to the law of diminishing returns ü (1)

#### 2.2.3 Description of characteristics mentioned in Q2.2.2

As the quantity of fertilizer applied to the piece of land increased , yield of maize

Increased but additional units of fertilizer led to decreased increase in maize yield ü ü

#### 2.2.4 Optimal input of fertilizer

15 Kg of fertilizer ü

#### 2.2.5 Deduction of the function of land

- Land provides food ü
- Land provides space ü (Any 1) (1)

#### 2.2.6 TWO methods of increasing land productivity other than fertilisers

- The use of scientific methods/technology/precision farming ✓
- Improving water management ü
- Changing cropping practices/intercropping ü
- Restoring land potential/avoid erosion ü
- Farming land more efficiently/consolidating small uneconomical land

units ü

(Any 2) (2)

[13]

## **1.1 Labour**

### **1.1.1 Tasks performed by labourers**

- (a) Feeding stud rams - Permanent ✓ (1)
- (b) Sheep shearing - Seasonal ✓ (1)
- (c) Installation of water troughs - Casual ✓

(1)

### **1.1.2 TWO ways to improve living conditions of farm labourers**

- Better housing that is safe and secure/sanitation ✓ (1)
- Supply of water/food/electricity ✓ (1)
- Recreational facilities to relax and socialise ✓

(Any 2) (2)

## **1.2 Labour contract and legislation**

### **1.2.1 Letters associated with the condition addressed by legislation**

- a) Labour Relations Act – B ✓ (1)

(b) Occupational Health and Safety Act - C✓ (1)

(c) Basic Conditions of Employment Act - A ✓ (1)

### 1.2.2 Name of the document

Labour/employment contract ✓ (1)

[9]

## Activity 2.1

### Memorandum

#### 2.1 HIV/AIDS and its negative impact on productivity

##### 2.1.1 TWO implications of HIV/AIDS on the agricultural sector

- Productivity will decrease ✓
  - Knowledge/experience/skills are lost ✓
  - Makes planning difficult✓ (Any 2)
- (2)

##### 2.1.2 A measure that can be taken by a farmer to address HIV/AIDS

- Awareness campaigns/education ✓
  - Access to anti-retroviral medication ✓
  - Access to treatment to STD's✓
  - Education in acceptable moral behaviour ✓
  - Access to condoms ✓
  - Establish support groups ✓ (Any 1)
- (1)

#### 2.2 Labour

##### 2.2.1 The types of farm workers

(a) Casual worker - Brick-layer ✓ (1)

(b) Manager - Dairy foreman ✓ (1)

(c) Unskilled worker - General workers ✓

(1)

(d) Skilled worker - Electronic feeding machine operator/brick layer ✓

(1)

## **2.2 Duties performed by farm workers**

### **2.3.1 Identification of the example of labour**

(a) WORKER 1 - Casual worker ✓

(1)

(b) WORKER 2 - Seasonal worker ✓

(1)

### **2.3.2 Reason**

Worker 2 performs repetitive tasks/work ✓

(1)

### **2.3.3 TWO ways to increase labour productivity**

- Improve economic conditions of workers ✓
- Improve educational conditions/training ✓
- Improve working conditions ✓
- Improve living conditions ✓
- Addressing HIV/Aids ✓
- Managing labour/supervision ✓
- Efficient mechanisation ✓
- Proper planning ✓
- Involvement of workers in decision making ✓
- Motivation ✓

(Any 2) (2)

[1

**3.2.1 Identification of the curves**

(a) Movable capital assets - A ✓ (1)

(b) Fixed capital assets - B ✓ (1)

**3.2.2 Reason**

The value of the fixed assets appreciates ✓ (1)

**3.2.7 TWO problems of capital**

• Depreciation ✓ (1)

• Scarcity/shortage of capital ✓ (1)

• Expensive/high cost ✓ (1)

• Over-capitalization ✓ (1)

• Under-capitalization ✓ (1)

• Risk factor ✓ (1)

• High interest rate/interest rate may change ✓ (1)

(Any 2) (2)

**1.2 Budget**

**1.2.1 The type of budget**

Enterprise budget ✓ (1)

**1.2.2 Calculation of the profit/loss**

Profit/loss = Total income – Total expenditure ✓

R197 500 ✓ – R143 500 ✓ = R54 000 ✓ (4)

**1.2.3 Indication of whether the farmer should continue or not with the enterprise**

The farmer should continue ✓ (1)

#### 1.2.4 Reason for the answer

The enterprise made a profit of R54 000 ✓ (1)

[12]

## ACTIVITY 2

### MEMO

#### 1.1 Capital

##### 1.1.1 Identification of the type of capital

A Movable ✓ (1)

B Fixed ✓ (1)

C Working/floating/production ✓

##### (1) 1.1.2 TWO methods of creating capital

- Savings ✓
- Production ✓
- Credit/loan ✓
- Inheritance ✓
- Grants/donations ✓

(Any 2) (2)

#### 4.2 Financial records of a farm

##### 4.2.1 Identification of the financial record

Cash flow statement ✓ (1)

##### 4.2.2 ONE reason

**Because it shows**

- All income and expenditure for a specific period ✓
- Income/receipts ✓
- Expenditure/payments ✓



- Opening/closing balances for each month ✓
- Profit/loss for each month ✓
- Cash items only ✓ (Any 1) (1)

#### 4.2.3 Calculations of Profit of R9650

$$\begin{aligned} &\text{Total income} - \text{Total Expenses} \\ &= \text{R } 13300 - \text{R } 3650 = \text{R } 9650 \end{aligned}$$

#### 4.2.5 Calculation of the profit/loss for December represented by A

$$\begin{aligned} \text{Profit/loss} &= \text{Total income} - \text{Total expenditure} \\ &= - \text{R } 4\,574 / \text{R } 4\,574 \text{ loss} \end{aligned} \quad (3)$$

#### 4.2.6 Closing balance represented by B

- R500 + R9 650 ✓
- R10 150 ✓ (2)

### [12 QUESTION 5]

#### 5.1.1 Identification of the types of capital

A - Fixed ✓ (1)

B - Movable ✓

#### (1) 5.1.2 Example of production capital/C

Seeds/fuel/feeds/wages/fertilizer/chemicals/transport costs ✓

(1)

#### 5.1.3 Types of credit

(a) A - Long-term credit ✓ (1)

(b) C - Short-term credit ✓ (1)

#### 5.1.4 ONE method of creating capital

- Production ✓
- Savings ✓
- Credit/loans ✓
- Grants/sponsors/donations ✓
- Inheritance/trust funds ✓
- Partnerships ✓ (Any 1) (1)

### **5.1.5 Two sources of capital**

Commercial banks ✓

Trust company financial institutions/Land Bank✓

Potential business partner ✓

Agricultural Cooperatives ✓

## **5.2 Income and expenses**

### **5.2.1 Identification of the enterprise**

(a) Highest income - B ✓ (1)

(b) Lowest expenses - C ✓ (1)

### **5.2.2 The financial record**

Income statement ✓ (1)

### **5.2.3 Calculation of the profit or loss of enterprise A**

Profit/loss = Total income – Total expenses ✓

= R30 000 – R50 000 ✓

= – R20 000/loss of R20 000 ✓ (3)

### **5.2.4 Enterprise A ✓**

## **5.3 Problems associated with capital as a production factor.**

- 5.3.1 Scarcity/shortage/expensive/costly ✓ (1)
- 5.3.2 Overcapitalisation ✓ (1)
- [14]**

## QUESTION 6

- 1.1.1 **6.1.1 Management:** ✓ the farm owner is seen doing the managerial work e.g. planning. ✓ (2)
- 1.2 a) **Day to day planning** will enable workers to know what is that which they are supposed to be doing per day. ✓✓ (2)
- b) **Efficient mechanization** will relieve workers from doing hard labour. ✓✓ (2)
- 1.3 Management
- 6.1.1 **TWO principles of management**
- (a) Implementation ✓ (1)
- (b) Planning ✓ (1)
- 6.2 **ONE example for each of the following**
- (a) Internal force**
- Available resources ✓
  - Available management capacity and competencies ✓
  - Organisational structure ✓
  - Culture of the business ✓
  - Financial position of the farm business ✓
  - Management systems available ✓
  - Products produced ✓
  - Investment in research and development ✓
  - The use of outdated equipment ✓ (Any 1) (1)

**(b) External forces**

- Economic forces ✓
- Political forces ✓
- Ethical forces ✓
- Legal forces ✓
- Socio-cultural forces/population demographics ✓
- Education levels in the area ✓
- Competition ✓
- Technology ✓
- Environmental forces/nature ✓

(Any 1) (1)  
[10]

**QUESTION 7**

**7.1 (a) Management principles/Components of management:**

- **Planning✓:** It involves deciding what to do, when to do it and how to do it and who is going to do it. It involves financial planning, farm activity planning and market planning. ✓✓
- **Organisation✓ and coordination:** It involves bringing together physical, human and financial resources to achieve objectives✓✓
- **Leading✓:** It involves giving direction, guidance and setting the plan to motion. ✓✓
- **Control✓:** It involves checking and verification of the results of the decision making. Control can be delegated, must be

economical and must always leads to corrective action. ✓✓

(12)

**(b) Sources of risk in farming**

- Production risks✓
- Marketing risks ✓
- Financial risks ✓
- Legal risks ✓
- People / Human risks ✓ (4)

**(c) Risk diversification**

- **Minimise safety risks✓**: Avoid short cuts and make workers have proper protective clothing (Proper protective gear). Working machinery or equipment must be well serviced. ✓
- **Using good agricultural farming practices✓**: These will include rotational grazing and nutrient management planning. ✓
- **Good cooperation and support for farmers with their neighbours✓**: This will include sharing of labour and skills that will minimize costs on outsourcing. ✓
- **Attention to business management✓**: A farm manager must always analyses the impact of decisions on the financial performance before a new practice is implemented. ✓
- **Making use of free assistance✓**: The States Departments do give free assistance and advice or warning on certain things e.g. the army worm invasion. ✓
- **Health and disability insurance for workers✓**: If workers are insured, production will be good because they will be able to get good health services. ✓
- **Property and liability insurance ✓**: It is good to insure the property, machinery against things like storms, hail damage, injury of the visitor etc. ✓ (6)

## **QUESTION 8**

### **1.1 Risk**

#### **8.1.1 TWO sources of risks**

- Production risk ✓
- Technical risk ✓
- Financial/market and price risk ✓

(Any 2) (2)

#### **8.1.2 Reason**

• Production risk - Machinery breakdown/ environment poses a risk to production ✓

- Technical risk - Machinery breakdown ✓
- Financial/market and price risk - Loss of sales ✓

(Any 2) (2)

#### **1.1.3 Identification of a risk management strategy**

Diversification ✓ (1)

#### **8.1.4 ONE management principle**

- Planning ✓
  - Organisation/coordination ✓
- Decision making ✓
- Implementation ✓
- Control ✓

(Any 1) (1)

## MARKETING

### QUESTION 1

#### 1.1.1 Identification of marketing functions

B transportation

C packaging

#### 1.1.2 TWO aspects to consider when choosing packaging material

Provide information about the product/identification ☐

Convenient for handling/containment ☐

Biodegradable/recyclable ☐

Free from chemicals/foreign objects ☐

Protection against mechanical damage ✓

#### 1.1.3 Advantages of processing

Job creation✓

Value adding✓

Improving shelf life✓

Way of overcoming wastage✓

Reduction of oversupply✓

Farmers receive fair price for their produce✓

The product must fit well in the container✓

The package must display the brand✓

#### 1.1.4 Two aspects to consider when choosing D

Protection of produce✓

Identification of product✓

#### 1.2 Marketing function matching statements

1.2.1 Packaging✓

1.2.2 Storage✓

1.2.3 Processing✓

1.2.4 Distribution✓

### QUESTION 2

## **2.1 1Definition of marketing**

It includes all the processes involved in moving the product from the farm to the consumers ü ü

### **2.1.2 Marketing Mix elements**

Price ü

Product ü

Promotion/Advertising ü

### **2.1.3 Synonym for consumers**

Customers ü

### **2.1.4 Indication of statements**

- a) Marketing✓
- b) selling✓
- c) selling✓
- d) Marketing✓
- e) Selling✓

## **QUESTION 3**

**3.1 1 Demand** The quantity of produce consumers are will and able to buy at a specific price and time✓✓

**3.1.2 Supply** The quantity of a good that producers are willing to sell at a given price and time.✓ ✓

**3.1.3 The Law of Supply-** As price increases, the quantity of goods sold increases. ✓✓

**3.1.4 Market Equilibrium-** A point on demand and supply curve when demand and supply are equal✓✓



3.1.5 As price increases✓, the quantity of goods bought decreases. ✓

#### **QUESTION FOUR**

4.1.1 A✓

4.1.2 A✓

4.1.3 C

4.1.4 D

4.1.5 C

#### **QUESTION 5**

##### **5.1.1 Marketing concept illustrated by A and B**

Price inelasticity of demand✓ (1)

##### **5.1.2 Reason**

The demand changed slightly despite the huge change in price ✓

##### **5.1.3 Explanation of consumer behaviour**

Maize meal is a necessity/staple food □ people will therefore buy maize meal even with a price increase □

##### **5.1.4 TWO other products**

Sorghum✓

Wheat✓

##### **5.1.5 ONE product that would have caused difference in behaviour**

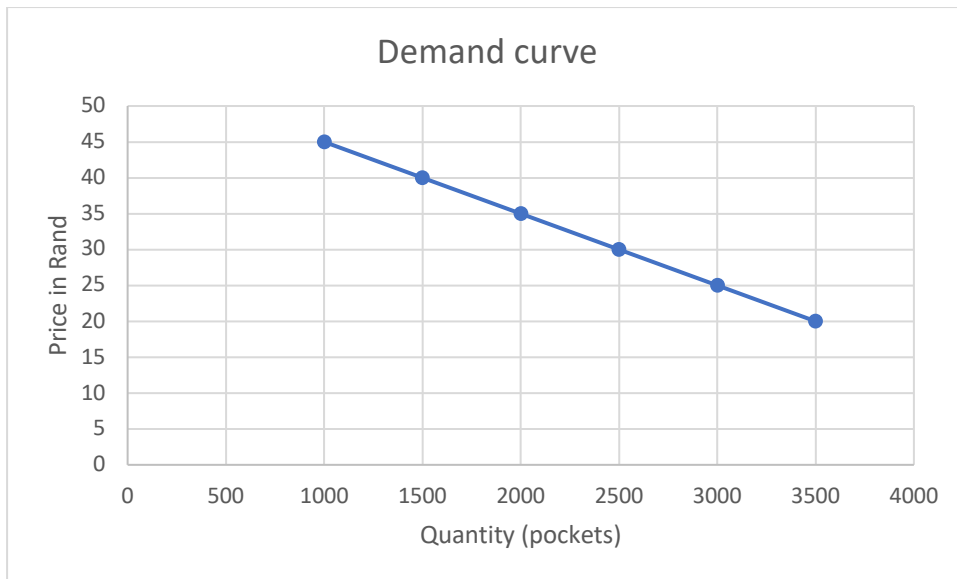
Cheese✓

Butter✓

Any 1 (1)

#### **QUESTION 6**

##### **6.1.1 Line graph of demand curve**



### Criteria for marking graph

- Title- demand curve ✓
- Line graph ✓
- Y axis correctly calibrated and labelled Price ✓
- X axis correctly calibrated and labelled Quantity ✓
- Units ( R and pockets) ✓
- Accuracy ( 80% points correctly plotted) ✓ (6)

6.1.2 The quantity of fruits bought decreased as price increased ✓✓ (2)

## QUESTION 7

### 7.1 Changing underlined words

7.1.1 Cooperative marketing✓

7.1.2 Barter✓

7.1.2 Marketing✓

7.1.4 Processing✓

7.1.5 Buyer✓

## QUESTION 8

### 8.1.1 Price Elasticities

( a) A✓

(b) B✓

### **9.3.1 Identification of free marketing channels**

- a) Farm gate marketing✓ (1)
- b) Auction✓ (1)
- c) Internet marketing✓ (1)
- d) Fresh produce market✓ (1)

### **9.3.2 Disadvantages of free marketing systems**

There is market risk to the producer✓

Price fixing may occur✓

There is greater fluctuation in price✓

(2)

### **9.4 1 Free marketing✓**

### **9.4.2 Producers sold vegetables from door to door✓**

Each individual was responsible for their own sales✓

### **9.5. 1 Identification of marketing system**

Cooperative marketing✓

### **9.5.2Justification**

Good are pooled together and sold ✓

### **9.5.3 Advantages of cooperative marketing system**

Lower marketing costs✓

More bargaining power✓

Access to funding/credit✓

Services are supplied cheaper✓

### **9.5.4 Factors that hamper marketing of agricultural produce**

High transport costs✓

Lack of capital✓

Seasonal character of production✓

Accidents, theft and spoilage along the marketing chain✓

Bulkiness in relation to its value✓

### **10.1.1Identification of marketing chain**

Agribusiness marketing chain✓

### **10.1.2 Factor that may hamper the marketing at stage E**

Spoilage✓

Theft✓

### **10.1.3 TWO Ways to improve the marketing chain between Stage A and E**

Provide good road infrastructure ✓

Provide capital ✓

Provide security✓

Provide storage facility✓

Any 2 (2)

### **11.1.1 TWO Reasons for drawing up a business plan**

Helps manager to think through the financial details✓

Helps define goals✓

Helps manager to plan for capital requirements✓

Help secure funding from financial institutions✓

Provides guidelines for decision making✓

Any 2 (2)

### **11.1.2 Major components of business plans**

The title page✓

Content page✓

Executive summary✓

Production plan✓

Financial plan✓

The human resource plan✓

Business concept✓

The marketing plan✓

Any 2 (2)

### **9.1.3 TWO Problems encountered when drawing agribusiness plans**

Insufficient research✓

Hiding risks and weaknesses

Using incorrect format✓

Setting unrealistic goals and assumptions✓

Insufficient technical details✓

Any 3 (3)

### **11.2 Swot analysis**

11.2.1 Weakness✓

11.2.2 Threat✓

11.2.3 Threat✓

11.2.4 Threats✓

11.2.5 Threats✓

11.2.6 Threat✓

11.2.7 Strength ✓

4.3.8 opportunity✓

- 11.2.9 Opportunity✓
- 11.2.10 Threat✓
- 11.2.11 Opportunity✓
- 11.2.12 Weakness

#### **4.4 1 Swot analysis**

- A Strength✓
- B Opportunity✓
- C Weakness✓
- E Opportunity✓

#### **11.2.2 How the farmer may use the strengths and opportunities**

. farmer may grow carrots on the arable land with irrigation to make profit. ✓✓

#### **12.1 THREE phases of the entrepreneurship process**

- Identification of an opportunity✓
- Evaluation of the opportunity✓
- Determining the resources needed. ✓

#### **12.1.2 THREE personal characteristics of a successful entrepreneur**

- Passion and positive attitude✓
- Strong leadership skills✓
- Self control✓
- Creative and innovative thinking✓
- Risk taker

### **QUESTION 13**

#### **Identification of Market Segmentation types**

- 13.1.1 multi-segment marketing ü
- 13.1.2 Niche marketing ü
- 13.1.3 Mass marketing ü

[6]

## TOPIC 6 BASIC AGRICULTURAL GENETICS

### A term for genetic make-up

#### 1.1.1 Genotype (1)

#### 1.1.2 Mendel's law of inheritance

Mendel's law of segregation (1)

#### 1.1.3 Mendel's law of independent assortment

Different pairs of genes separate independently of the members of other pairs ☐ when two or more characteristics are involved  
☐ (2)

### Monohybrid crossing

#### 1.2.1

Gametes	r	r
R	Rr	Rr
R	Rr	Rr

## MARKING RUBRIC

- Correct gametes of male parent ☐ (1)
  - Correct gametes of female parent ☐ (1)
  - Correct genotype of the offspring ☐ (1)
- Punnett square populated with gametes and offspring ✓

### 1.2.2 Percentage of red piglets

- $\frac{0}{4} \times 100$  ☐
- = 0% ☐ (2)

### QUESTION 2

Male animal (bull) is represented by: XY .....gametes X or Y ✓

- Female animal (cow) is represented by: XX gametes X or X ✓

	X	Y
X	XX	XY
X	XX	XY

✓

Therefore 50 % chance of female calf ✓

### QUESTION 3

A	B	C
Shape ✓	Colour ✓	Colour ✓

Shape - round ✓

Colour - white ✓

- 4.1.1 r ✓ - recessive ✓ **OR**  
 R<sup>w</sup> / W ✓ - co-dominant ✓

(2)

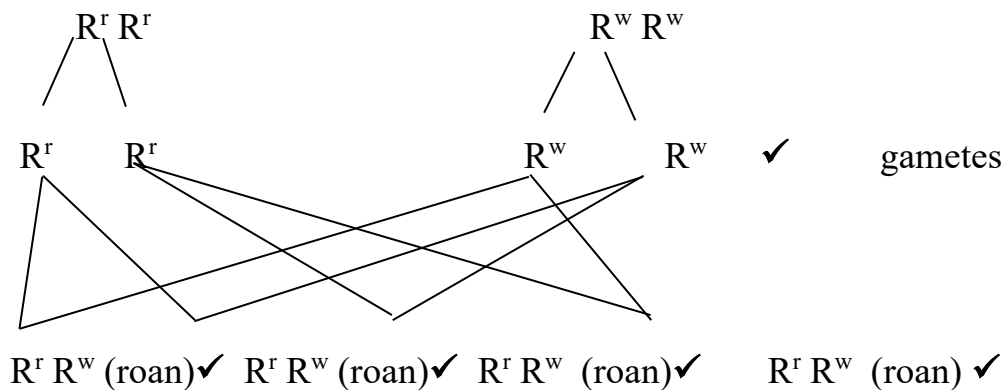
4.1.2  $R^r / R^r R^w / RW$  ✓ –crossing of red ( $R / R^r$ ) and white ( $R^w / W / r$ ) ✓ (2)

This question allows for different interpretations by learners:

Co-dominance scenario:

Pure-bred red animal

Pure-bred white animal



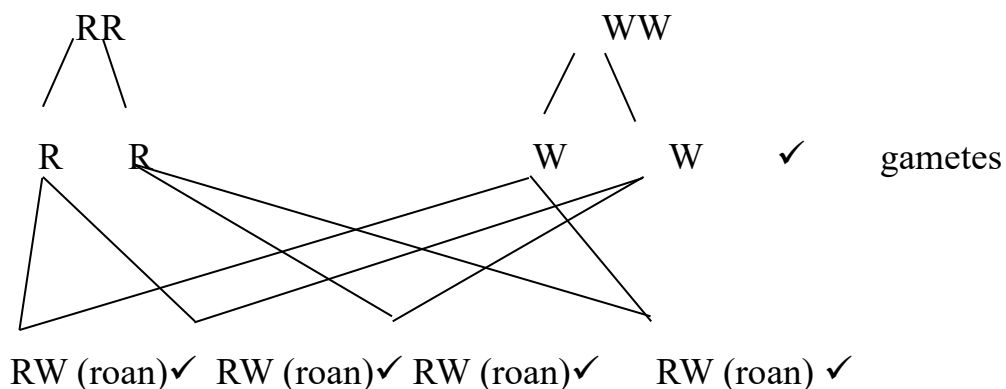
(Schematic representation) ✓

**OR**

Co-dominance scenario (alternative):

Pure-bred red animal

Pure-bred white animal



(Schematic representation) ✓

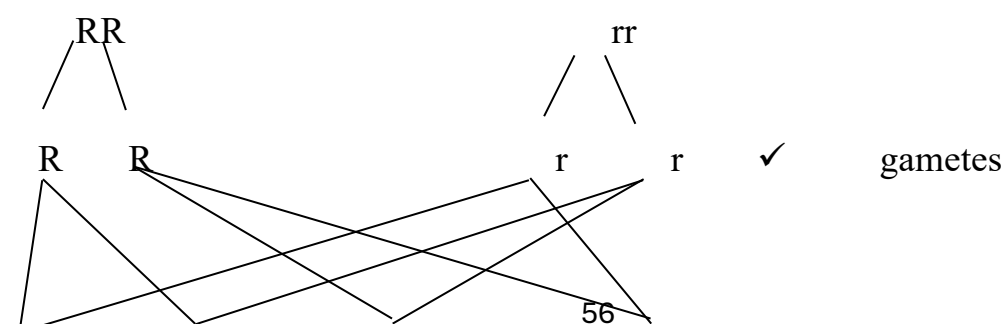
(6)

**OR**

Incomplete dominance scenario:

Pure-bred red animal

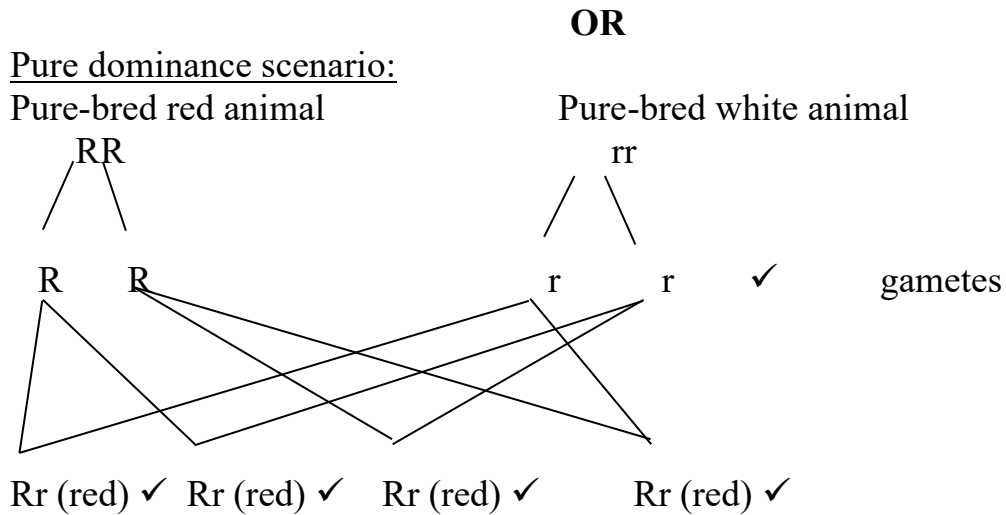
Pure-bred white animal





Rr (roan)✓ Rr (roan) ✓ Rr (roan)✓ Rr (roan) ✓

(Schematic representation) ✓ (6)



(Schematic representation) ✓ (6)

- 5.1.2 Genotype of individuals
- No. 1 - aa ✓
  - No. 8 - Aa ✓
- (2)
- 5.1.3 Phenotype of individuals
- No. 5 - dark ✓
  - No. 12 - white ✓
- (2)
- 5.1.4. (a) Homozygous - No. 10 ✓
- (2)
- (b) Heterozygous - No. 3 ✓

6.1 The diagram depicts the causes of variation in plants.

- 6.1.1 Soil factors ✓  
 Temperature ✓  
 Light intensity ✓  
 Diseases ✓  
 Moisture content from the ground ✓

- (3)  
 6.1.2 Height of the crops ✓

### **Variation & Selection**

- 6.2.1 Natural selection ✓

(1)

- 6.2.2 **TWO important uses of variation in breeding**

- Improvement of existing breeds/cultivars/selection of parent stock ✓
- Bring about/introduce new breeds/cultivars ✓
- Brings about evolution ✓

(Any 2)

- 6.2.3 **Influence of heritability of characteristics**

- The higher the heritability of characteristics, ✓ the quicker the improvement of breeding programme ✓

## **18 Heredity in sheep**

- 18.1 Fleece weight ✓  
 Lowest heredity characteristic of 17% ✓

(2)

- 18.2 (a) Post-weaning gain ✓

(1)

- (b) Birth weight ✓

(1)

- (c) Fleece weight ✓

(1)

- 18.3 Housing (environmental factor) ✓  
 Nutrition (environmental factor) ✓  
 Pests and diseases ✓  
 2)

(Any

- 7.1 • Mass selection ✓

- Pedigree selection ✓
- Family selection ✓
- Progeny selection ✓.

(4)

## 7.2.1 Traditional selection method

### 1.2.1 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)

### 7.2.2 Method of selection in the scenario.

- Mass selection ✓

### 7.2.3 THREE characteristic considered for selection

- Growth ✓
- Health ✓
- Fertility ✓ (3)

### 7.2.4 Aspects to improve phenotype of animals

- (a) Best bulls for growth/health/fertility were shared ✓
- (b) Utilizing the best available pastures/keeping them away from wet/muddy areas ✓
- (2)

## 8.1 Breeding systems and technologies

### 8.1.1 The breeding methods:

- A. Upgrading ✓
- B. Inbreeding ✓
- C. Crossbreeding ✓

(3)

### 8.1.2 Breeding method for heterosis

C/A ✓ (1)

### 8.1.3 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) (2)

8.1.4 **Change the enterprise from Brahman to a Bonsmara**  
Upgrading/A ✓ (1)

## QUESTION 9

9. **Horse, donkey and the mule.**

1

9.1.1 **Breeding system**

Species crossing ✓

(1)

9.1.2 **Type of animal**

Mule ✓

(1)

9.1.3 **TWO uses of the mule in farming**

- Used as draught animals for pulling implements/ploughing ✓
- To carry loads ✓ (2)

## QUESTION 10

### Polygenetic inheritance

101.1  $AaBcCcDD$  plant =  $40\text{cm} + 4\text{cm} + 4\text{cm} + 4\text{cm} + 4\text{cm} + 4\text{cm}$  ✓

=  $60\text{cm}$  ✓

10.1.2 Genotype of 68cm tall plant

a)  $AABBCCDd/AABBCcDD/AABbCCDD/AaBBCCDD$  ✓

b) Phenotype of the shortest plant

40cm✓

## QUESTION 11

### 11.1 Techniques to change DNA of tomato plant

#### TWO other methods

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

#### 11.1.2 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)

### 11.2 Genetically modified sorghum

- 11.2.1
- Enriched with vitamins ✓
  - Balanced in terms of nutrition/prevent malnutrition ✓
  - To alleviate the problem of poverty/hunger in Africa ✓
  - Improve cultivars (Any 2) 2

- 11.2.1
- GM sorghum will be vitamin enriched (packed) ✓
  - to help fight malnutrition ✓
- (2)

#### 11.2.2 Dangers of GM food

- GM food risk destabilising the environment ✓
- GM food risk destabilising food production ✓

(2)

Genetic engineering/biotechnology/Genetic manipulation □.✓

- Rapid improvement of genetic make up □✓
- Built in DNA from another organisms to manipulate characteristics □✓
- Change the genetic make-up of a plant □✓
- Change/improve the characteristics of a plant cultivar □✓ (Any 2)

A Desired gene inserted into plasmid ✓

B Plasmid inserted into plant cell/disabled to prevent them from causing disease in the recipient plant □✓

C Plasmid inserts desired gene into plant DNA/Used as a carrier to transfer a piece of its DNA into the chromosome of a plant ✓

D Tissue culture is then formed/Plant pieces are then grown into whole ✓

- Reduce the need for chemical spraying/herbicides ✓
- Tolerant to extreme conditions(cold, drought, salinity) ✓

(1)

