



NATIONAL SENIOR CERTIFICATE EXAMINATION  
NOVEMBER 2015

**AGRICULTURAL SCIENCES: PAPER I**

**MARKING GUIDELINES**

Time: 2½ hours

150 marks

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**These marking guidelines are prepared for use by examiners and sub-examiners, all of whom are required to attend a standardisation meeting to ensure that the guidelines are consistently interpreted and applied in the marking of candidates' scripts.**

**The IEB will not enter into any discussions or correspondence about any marking guidelines. It is acknowledged that there may be different views about some matters of emphasis or detail in the guidelines. It is also recognised that, without the benefit of attendance at a standardisation meeting, there may be different interpretations of the application of the marking guidelines.**

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**SECTION A**

**QUESTION 1**

1.1.1	A	B	C	<del>D</del>
1.1.2	A	<del>B</del>	C	D
1.1.3	<del>A</del>	B	C	D
1.1.4	A	<del>B</del>	C	D
1.1.5	A	B	<del>C</del>	D
1.1.6	A	B	<del>C</del>	D
1.1.7	A	<del>B</del>	C	D
1.1.8	A	B	<del>C</del>	D
1.1.9	A	B	C	<del>D</del>
1.1.10	<del>A</del>	B	C	D

(20)

	A only	B only	A and B	None
1.2.1	A	B	C	<del>D</del>
1.2.2	<del>A</del>	B	C	D
1.2.3	A	<del>B</del>	C	D
1.2.4	<del>A</del>	B	C	D
1.2.5	A	B	<del>C</del>	D

(10)

1.3.1	Pancreas
1.3.2	Feedlot/Feeding pen
1.3.3	Holding pen/crush
1.3.4	Digestible energy
1.3.5	Vitamin A

(10)

1.4.1	Indigenous
1.4.2	Reticulo-rumen
1.4.3	Red
1.4.4	Synchronisation
1.4.5	Biological

(5)

**45 marks**

**SECTION B**

**QUESTION 2 ANIMAL NUTRITION**

**2.1 Diagrams of alimentary canals of farm animals**

**2.1.1 Justification of ruminant**

- Four different compartments visible in stomach area/complex stomach
  - Has a large compartment in stomach area/fermentation vessel/rumen
  - Very long small intestine
  - Very large/enlarged caecum
- (Any 2) (2)

2.1.2 Diagram 1 (1)

**2.1.3 Type of micro-organism**

- Protozoa
  - Bacteria
- (2)

**2.1.4 Conditions in the stomach**

- Anaerobic environment/oxygen free environment
  - Warm environment
  - Wet environment
  - Suitable pH
  - Sufficient nutrients/regular intake of feed
  - Easily digestible carbohydrates
  - Sufficient mineral nutrients
  - Sufficient Nitrogen
  - Mechanism for removal of waste products/excretion
- (Any 2) (2)

**2.1.5 Changes in the digestion process**

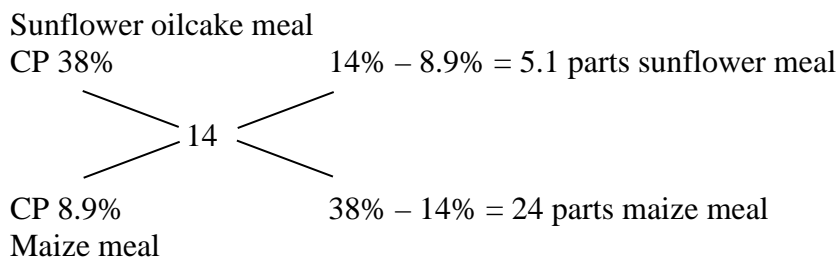
- Changes in the composition of the micro-organisms
  - Changes in the type of fatty acids that are formed
  - Changes in the quantity and type of gasses which are formed
  - Changes in pH of the stomach content
  - Changes in the rate of digestion
- (Any 3) (3)

**2.2 Table representing the nutritional information of selected feeds**

**2.2.1 Feed selection**

- (a) Silage (1)
- (b) Lucerne hay (1)
- (c) Maize meal (1)

**2.2.2 Pearson square calculation**



**5,1 sunflower oilcake meal : 24 maize meal**

OR

Mix 5.1 parts of sunflower oilcake meal with 24 parts of maize meal (5)

## 2.3 Digestibility of a feed

### 2.3.1 Calculation of digestibility coefficient

Hay: 10% of 15 kg = 1.5 kg moisture

Therefore 15 kg – 1.5 kg = 13.5 kg of dry matter

Digestibility coefficient

$$\begin{aligned}
 &= \frac{\text{DM intake (kg)} - \text{DM of manure (kg)}}{\text{DM intake (kg)}} \times 100 \\
 &= \frac{13.5 \text{ kg} - 4 \text{ kg}}{13.5 \text{ kg}} \times 100 \\
 &= 70.4\%
 \end{aligned}
 \tag{4}$$

### 2.3.2 Definition

Digestibility refers to the actual quantity of feed absorbed by an animal. (1)

### 2.3.3 Explanation

Crude fibre is not easily digestible therefore the higher the crude fibre content the less digestible the feed becomes. (2)

## 2.4 Vitamins and minerals

2.4.1 Vitamin A/Retinol (1)

2.4.2 Vitamin E (1)

2.4.3 Phosphorus/P (1)

## 2.5 Fodder-flow graph

2.5.1 2/two months (1)

### 2.5.2 Calculation of feed shortage

Tons of feed required = 120 tons

Tons of feed available = 80 tons

Feed shortage = 120 – 80 = 40 tons

1 ton = 1 000 kg

Therefore 40 tons = 40 000 kg (3)

### 2.5.3 Cost-effective measures

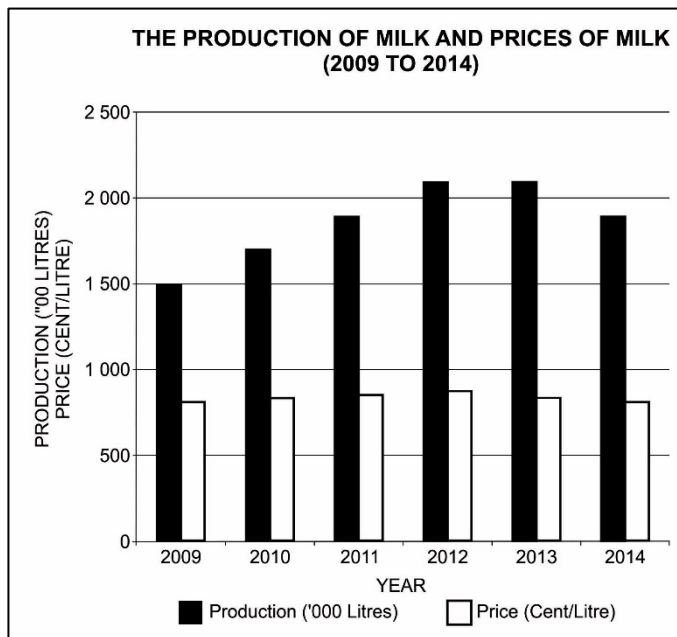
- Cutting fodder
- Baling/making hay/ensiling (making silage)
- Storage (3)

**[35]**

**QUESTION 3 ANIMAL PRODUCTION, PROTECTION AND CONTROL**

**3.1 South African dairy industry**

3.1.1



**Bar graph checklist**

Evidence	Yes	No
Heading	1	0
X-axis labelled (both labels)	1	0
Y-axis labelled (both production and price)	1	0
Correct values	1	0
Bar graph: Price	1	0
Bar graph: Production	1	0

(6)

**3.1.2 Milk production tendency**

- The production increase from 2009 to 2012
- From 2012 to 2013 it stabilises
- From 2013 to 2014 it decreases

(Any 2) (2)

**3.1.3 Factors**

- Drought
- Low producer/milk prices – not profitable business

(2)

**3.2 Abnormal behaviours of farm animals**

- Mutilation/behaviour that hurts the animal or another
- Repetitive behaviours
- Abnormal reproductive behaviours (e.g. cows behaving like bulls)
- Aggressive behaviours
- Isolation

(Any 2) (2)

### 3.3 Handling facilities

#### 3.3.1 Factors to be considered

- Site/Space/Type of surface
- Location/Slope
- Design/Farming system
- Materials
- Layout
- Size of the herd
- Breed of animal
- Affordability/Economic implication
- Safety
- Availability of labour

(Careful when marking not to confuse 3.3.1 with 3.3.3) (Any 2) (2)

#### 3.3.2 Reasons for having a crush

- To ensure safety (handler and animals) while working with large animals
- To be able to work with animals while they are static/stable
- To perform specialised practices on animals (AI, dehorning, castrating, tattooing, branding, applying medication, physical examination, treatments)
- Time and labour costs
- Normally connected to a loading facility to load animals easier

(Any 2) (2)

#### 3.3.3 Basic principles when handling cattle

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

(Any 4) (4)

#### 3.3.4 Consequences/implications

- Injuries to animals (stampede)
- Injuries to handlers (fatal)
- Damage to property
- Lower quality of carcass/poor meat quality
- Lactating animals will have lower production
- Miscarriages or abortions in pregnant animals
- Animals run away/wild behaviour/stress

(Any 2) (2)

**3.4 Transporting animals****3.4.1 Aspects to consider**

- Do not transport young and old animals together
  - The floor of the truck must not be slippery
  - Obtain a movement permit/other relevant documents
  - Strong structure/enclosures
  - Loading ramp must have suitable surface
- (Any 3) (3)

**3.4.2 Effect of poor handling on meat**

- Meat is bruised/bloody  
 Delayed rigor mortis  
 Poor colour/pale meat  
 Meat gets tough
- (Any 2) (2)

**3.5 Indigenous methods of controlling disease**

3.5.1 Herbs or local concoctions/mixtures (1)

**3.5.2 Commonly used methods**

- Gall smearing
  - Self-diagnosis
- (2)

**3.5.3 Control of ticks through bush burning**

- Destroy eggs/larva/nymph  
 Kills adult ticks  
 Host in the life cycle for 2 or 3 ticks are killed
- (Any 2) (2)

**3.5.4 Conventional control measures**

- Vaccination/inoculation
  - Injections
  - Bio-security/sanitation/proper handling of manure
  - Sufficient space/good ventilation
  - Isolation/quarantine/separation
  - Controlling pests and parasites/dipping/dosing
  - Good nutrition and supplementation
  - Breeding of resistant animals
  - Culling sick animals
- (Any 3) (3)

**[35]**

**QUESTION 4 ANIMAL REPRODUCTION****4.1 Bull reproductive system****4.1.1 Parts**

D – Vas deferens

E – Penis

F – Sheath

I – Scrotum

(4)

4.1.2 Spermatogenesis/sperm formation/gametogenesis

(1)

**4.1.3 Functions and parts**

D – Transports spermatozoa/enhances ejaculation

L – Facilitates penetration of ovum/releases an enzyme (hyaluronidase) that allows spermatozoa to penetrate the ovum/acrosome reaction

(2)

**4.1.4 Description**

Negatively affects sperm formation/spermatogenesis

Will not allow optimum spermatogenesis to take place

Sperm defects

(Any 2) (2)

**4.1.5 Reason**

Sperm production occurs at a temperature slightly (1 to 3 °C) lower than that of the body/to regulate the temperature for more effective spermatogenesis

(1)

**4.2 Cow reproductive tract****4.2.1 Processes**

1 – Ovulation

2 – Fertilisation

3 – Mitosis/Cell division

(3)

**4.2.2 Functions of fluid A**

Protects the embryo from shock

Suspends the embryo

Prevents the embryo from drying out

Makes calving easier by lubricating the birth canal during calving

(Any 2) (2)

**4.2.3 Function of B**

Passage for oxygen and nutrient from the maternal blood stream

OR Passage for waste products from the embryo

(2)

4.2.4 Luteinising hormone

(1)

**4.2.5 Adaptation of part F**

- Contains an acrosome with the enzyme

- Enzyme can dissolve the ovum wall

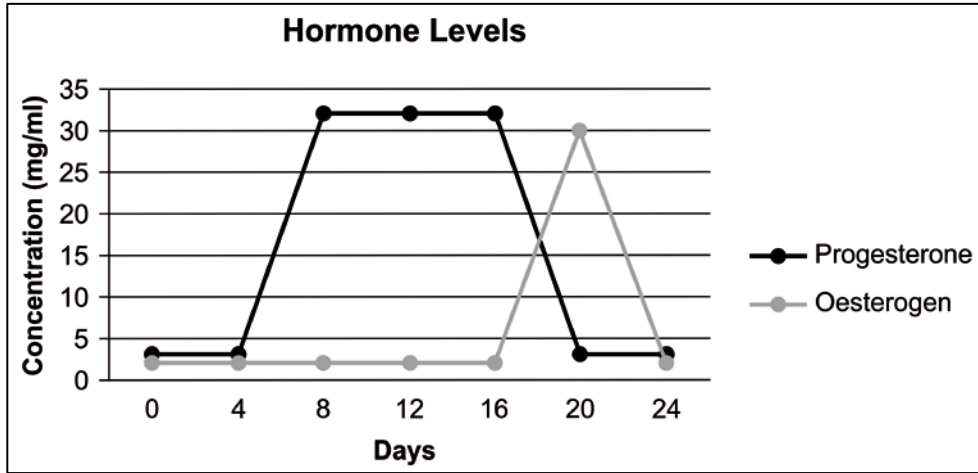
- Facilitates egg cell penetration as it moves forward

(Any 2) (2)



4.3 **Hormone levels**

4.3.1 **Line graph**



Line graph checklist

Evidence	Yes	No
Heading	1	0
X-axis labelled	1	0
Y-axis labelled (with mg/ml)	1	0
Correct values	1	0
Line graph: Progesterone	1	0
Line graph: Oestrogen	1	0

(6)

4.3.2 **Role of progesterone**

Inhibits/suppresses the secretion/functioning of oestrogen

(1)

4.3.3 **Day when follicle is fully developed**

Day 20

(1)

4.3.4 **Motivation**

- Oestrogen is at the highest level (30 mg/ml) OR
- Progesterone is at its lowest level (3 mg/ml)

(1)

4.4 **Artificial insemination in cattle**

4.4.1 **Definition of AI**

A technique whereby semen is artificially collected from bulls and artificially placed into the reproductive tract of a female

(2)

4.4.2 **TWO requirements of successful AI**

- Correct detection of heat/oestrus
- Correct timing
- Use of viable semen
- Correct technique
- Experienced and knowledgeable inseminator
- Observation of hygiene

(Any 2) (2)

**4.4.3 TWO signs of heat**

- There will be a visible bull string
- Cow will:
  - be restless
  - bully other cows
  - isolate herself from the herd
  - bellow as if looking for her calf
  - stand and stare into the distance over the fence
  - stand to be mounted by other females
  - mount other cows as if trying to mate with them

(Any 2) (2)  
**[35]**

<b>105 marks</b>
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**Total: 150 marks**