AGRICULTURAL SCIENCES P1
FEBRUARY/MARCH 2016
MEMORANDUM

MARKS: 150

This memorandum consists of 9 pages.
### SECTION A

#### QUESTION 1

1.1 1.1.1 B ✗✗  
1.1.2 A ✗✗  
1.1.3 D ✗✗  
1.1.4 C ✗✗  
1.1.5 C ✗✗  
1.1.6 C ✗✗  
1.1.7 B ✗✗  
1.1.8 A ✗✗  
1.1.9 D ✗✗  
1.1.10 D ✗✗  

1.2 1.2.1 B only ✗✗  
1.2.2 Both A and B ✗✗  
1.2.3 None ✗✗  
1.2.4 Both A and B ✗✗  
1.2.5 A only ✗✗  

1.3 1.3.1 Vitamin K/phylloquinone ✗✗  
1.3.2 Rabies ✗✗  
1.3.3 Vaccination ✗✗  
1.3.4 Embryonic ✗✗  
1.3.5 Oxytocin ✗✗  

1.4 1.4.1 Silage ✗  
1.4.2 Zinc/Zn ✗  
1.4.3 Pearson square ✗  
1.4.4 Fluke worm/liver fluke ✗  
1.4.5 Monozygotic/identical ✗  

**TOTAL SECTION A: 45**
SECTION B

QUESTION 2: ANIMAL NUTRITION

2.1 Alimentary canal of fowls

2.1.1 Identify
A – Crop ✓
B – Duodenum/small intestine ✓
E – Pancreas ✓

2.1.2 Ways in which structure C is adapted
• Thick, muscular walls for grinding feed ✓
• Presence of small stones for grinding feed ✓

2.1.3 Identification of structure B and estimation of pH
• Proventriculus/true stomach/glandular stomach ✓
• pH less than 7/acidic ✓

2.2 A schematic representation of the components of feeds

2.2.1 Identification of substances
A – Dry matter/DM ✓
B – Inorganic matter/minerals/elements/ash components ✓
C – Vitamins ✓

2.2.2 Distinction between oil and fat
Oil – Unsaturated/liquid at room temperature/plant origin ✓
Fat – Saturated/solid at room temperature/animal origin ✓

2.2.3 End-products of digestion
(a) Carbohydrate – Glucose/energy ✓
(b) Protein – Amino acids ✓

2.3 Fodder flow programme

2.3.1 Difference in feed requirement against the available feed for September
Feed requirement 66 tons – feed available 54 tons
= 12 tons deficit/shortage ✓

January
Feed requirement 49 tons – feed available 78 tons
= 29 tons surplus/excess ✓

2.3.2 Calculation of the total DM available for B
40 + 35 + 54 + 46 + 17 + 30 + 20 + 10 + 10 + 32 ✓
= 294 tons ✓

2.3.3 The month when the veld supplied 15 tons of fodder
February ✓
2.4 Co-efficient of digestibility of green lucerne

2.4.1 Determination of the co-efficient of digestibility of the green lucerne

\[ DC = \frac{\text{Dry matter intake (kg)} - \text{dry matter excreted (kg)}}{\text{dry matter intake (kg)}} \times 100 \]

\[= \frac{2.5 \text{ kg} \times 0.6 = 1.5 \text{ kg moisture}}{2.5 \text{ kg} - 1.5 \text{ kg} = 1.0 \text{ kg DM}}\]

OR

\[= \frac{2.5 \text{ kg} \times 0.4 = 1.0 \text{ kg DM}}{1.0 \text{ kg} - 0.255 \text{ kg} \times 100}{1.0 \text{ kg}}\]

\[= 74.5\% \]

2.4.2 Specific nutrient which fits each of the following descriptions:

(a) Iron/Fe ✓
(b) Cobalt/Co ✓
(c) Vitamin B2/riboflavin ✓
(d) Calcium/Ca ✓

2.5 Data representing the laboratory results of THREE feed

2.5.1 Calculation of the NR for feed 2

\[ NR = 1: \frac{\text{TDN\%} - \text{DP\%}}{\text{DP\%}} \]

\[= 1: \frac{75\% - 15\%}{15\%} \]

OR

\[= 1: \frac{60\%}{15\%} \]

\[NR = 1: 4 \]

2.5.2 Identification of the feed (1, 2 or 3) recommended

• Feed 2 ✓

2.5.3 Reason to justify the answer in QUESTION 2.5.2

• It has a narrower nutritive ratio ✓
• Suggesting a comparatively higher protein necessary for milk production ✓

(Any 1)

2.5.4 The cheapest feed

Feed 3 ✓

2.5.5 Reason for the answer in QUESTION 2.5.4

• This feed has a lower protein content ✓
• Feed with lower protein is cheap ✓

(Any 1)

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

3.1 An illustration of a proper housing structure for keeping broilers

3.1.1 Requirements of the roofing material to regulate temperature
- Have a reflective surface on the outside ✓
- Help to reduce conduction of heat ✓

3.1.2 TWO other ways in which temperature can be regulated
- Heat lamps/heaters in cold weather ✓
- Ventilation systems ✓
- Air conditioning ✓

3.1.3 Best orientation for a broiler house
- East ✓

Reason
- To reduce the effect of direct sunlight ✓

3.1.4 TWO purposes of the part labelled A
- To allow ventilation/air flow ✓
- To allow diffused sunlight ✓

3.2 The role of shelter in animal production

3.2.1 Forms of shelter
- Planting trees ✓
- Building kraals ✓
- Erecting concrete walls ✓

3.2.2 Consequences of lack of shelter
- Lower/slower growth/production ✓
- Exposure to predators ✓
- Exposure to pests ✓
- Stock theft ✓
- Higher feed intake when it is cold ✓
- lower feed intake when it is hot ✓

3.2.3 Reason to use up more energy
- To provide energy to sustain their body temperature ✓

3.3 The life cycles of two external parasites (ticks A and B)

3.3.1 Length for hatching of tick A's eggs
- 1 month ✓

3.3.2 Disadvantage to cattle
- Open wounds form ✓
- Through which blowflies can attack animals ✓
- This can cause diseases ✓
3.3.3 Two reasons for preventing parasite infestation
- Infected animals may die/Loss of production/income ✓
- Medication/treatment is expensive/higher production cost ✓ (2)

3.3.4 Reasons why it is difficult to control the numbers of tick B
- The adult stage is only found in birds ✓
- Which is difficult to catch/control/treat ✓ (2)

3.4 The role of the state in regulating farming practices

3.4.1 Type of research done by the state at the Veterinary Institute
- Veterinary research to improve vaccines/diagnostic/new products ✓
- Surveillance/control/preventing diseases ✓
- Producing disease/blood vaccines ✓ (3)

3.4.2 Purpose of a quarantine station
- To isolate/detain animals and ✓
- prevent diseases/pests entering/spreading in the country ✓ (2)

3.4.3 Other roles the state play to protect the animal industry
- Animal health schemes ✓
- Duties of owners of animals ✓
- Import bans ✓
- Importation of vaccines ✓
- Movement permits ✓ (Any 2) (2)

3.5 The temperature required by farm animals

3.5.1 Bar graph

The temperature requirements of farm animals

<table>
<thead>
<tr>
<th>Type of animal</th>
<th>Lower critical temp.</th>
<th>Optimum temp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cow</td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td>Calf</td>
<td>10</td>
<td>22</td>
</tr>
<tr>
<td>Piglet</td>
<td>15</td>
<td>25</td>
</tr>
<tr>
<td>Layer</td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td>Broiler</td>
<td>5</td>
<td>25</td>
</tr>
</tbody>
</table>

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Criteria/rubric/marking guidelines
Correct heading ✓
X axis – correctly calibrated and labelled (Type of animal) ✓
Y axis – correctly calibrated and labelled (Temperature) ✓
Correct units (°C) ✓
Accuracy ✓
Bar graph ✓ (6)

3.5.2 Deduction of farm animal with highest optimum temperature
Piglet ✓ (1) [35]

QUESTION 4: ANIMAL REPRODUCTION

4.1 The stages of the oestrous cycle in a cow

4.1.1 Indication of oestrous cycle stages:
   (a) C ✓ (1)
   (b) B ✓ (1)
   (c) A ✓ (1)

4.1.2 Hormones during stage C
   (a) Oestrogen ✓ (1)
   (b) Luteinising hormone ✓ (1)

4.1.3 The role of the hormone
   • Responsible for the rupturing of the membrane of the Graafian follicle ✓
   • It initiates ovulation ✓ (Any 1) (1)

4.1.4 Identification of the stage of the oestrous cycle labelled B
Pro-oestrus ✓ (1)

4.2 The female reproductive tract

4.2.1 Deposition of semen:
   (a) G ✓ (1)
   (b) F/E ✓ (1)

4.2.2 Identification of the structure collecting the ripe follicle:
   (a) A ✓ Infundibulum ✓ (2)
   (b) B ✓ Ampulla ✓ (2)

4.2.3 Concept of ovulation
   • Process whereby the membrane containing the ripe follicle bursts with the help of LH and ✓
   • the ripe ovum is released into the infundibulum ✓ (2)
4.3 The process of spermatogenesis

4.3.1 Deduction on the type of cell division:
Meiosis ✓ Reason - genetic material is reduced into half/diploid(2n) changed into haploid (n)/reduction division ✓ (2)

4.3.2 The stages of spermatogenesis:
C – Formation of the spermatids ✓
D – Formation of sperm cells/spermatozoa ✓ (2)

4.3.3 Part of the testes where spermatogenesis takes place
• Tubules seminiferous ✓ (1)

4.3.4 The organ where the spermatozoa achieve mobility
• Epididymis ✓ (1)

4.3.5 Similarity between spermatogenesis and oogenesis
• Both occur through meiosis to produce haploid cells ✓
• Both produce gametes/sex cells ✓ (Any 1) (1)

4.4 Mating during oestrus

4.4.1 Devices to detect oestrus in the cow
• Pedometer ✓
• Chin-ball marker ✓
• Tail-chalking ✓
• Kamar heatmount detector ✓ (Any 3) (3)

4.4.2 Sequential order of FOUR reproductive hormones that are produced by a cow
• Progesterone ✓
• Luteotrophic hormone/LTH/prolactin ✓
• Relaxin ✓
• Oxytocin ✓ (Any 4) (4)
4.5 Embryo transfer (ET) and superovulation

4.5.1 Definition of superovulation
- The production of a larger number of ova ✓
- at one ovulation ✓  (2)

4.5.2 THREE advantages of embryo transfer (ET)
- More progeny can be produced ✓
- Higher profits due to increase in sales ✓
- Productive lives of cows are increased ✓
- Genetics of the herd is conserved ✓
- Superior genes are introduced into the herd ✓  (Any 3)  (3)

4.5.3 Reason for using proven bulls
- To introduce superior/desirable genes into the herd rapidly and economically ✓  (1)  [35]

TOTAL SECTION B: 105
GRAND TOTAL: 150