ACKNOWLEDGEMENTS

The Ministry of Primary and Secondary Education wishes to acknowledge the following for their valued contribution in the production of this syllabus:

- The National Animal Science Non-Formal Syllabus Panel
- Zimbabwe School Examinations Council (ZIMSEC)
- UNICEF
Animal Science learning area will be assessed through continuous and summative assessment
1.0 PREAMBLE

1.1 INTRODUCTION

Zimbabwe embarked on an agrarian Land Reform to correct colonial land imbalances and empower the previously marginalised Zimbabweans with access to land. In order to safeguard this important national heritage and ensure food security through sustainable land use, it is very important for learners of diverse backgrounds to acquire necessary animal science knowledge and skills. This syllabus is designed for Level III learners in Animal Science. It is a learning phase which covers concepts, principles and practices in animal science. The syllabus will provide learners with a rich experience in identifying, investigating, problem solving and assessing the viability of sustainable animal husbandry. Learners will be assessed through continuous and summative assessments.

1.2 RATIONALE

Agriculture is a learning area studied from Level II (Primary) to Level II (Secondary), therefore it is imperative for learners to specialize at Level III so as to acquire adequate skills and knowledge to create employment and for further learning opportunities. Specialisation would enable learners to be proactive, productive, add value to the community and national economy. Animal science stimulates in learners, the responsibility to care for the local and global environment and to adopt sustainable animal husbandry. The animal science learners will at the end of the learning phase, value the dignity of labour and food sovereignty.

The Animal Science Non-Formal syllabus enables learners to develop the following skills:

- Research
- Production
- Value addition
- Marketing
- Enterprise development
- Technology and innovation
- Critical thinking
- Problem-solving
- Decision-making
- Conflict resolution
- Leadership and team-work
- Self-management
- Communication
1.3 SUMMARY OF CONTENT

The learning area will include the study of background to animal science, anatomy and physiology, nutrition, genetics and breeding, animal health, animal production and animal products and processing technology.

1.4 ASSUMPTIONS

It is assumed that learners have practical skills and knowledge in:

- livestock production
- sustainable use of agricultural resources
- e-learning
- marketing of animal products

1.5 CROSS-CUTTING ISSUES

The Animal Science learning area will encompass the following cross cutting themes:

- Disaster and risk reduction
- Enterprise skills
- Environmental issues
- Team work
- Sustainable resource utilisation
- ICT
- Inclusivity
- Safety and health

2.0 PRESENTATION OF SYLLABUS

The Animal Science Non-Formal syllabus is a single document covering Level III. The syllabus has a suggested list of resources to be used during teaching and learning.
3.0 AIMS

The syllabus aims to help learners to:

3.1 develop an appreciation of the socio-economic importance of animal science to agricultural development of the country
3.2 develop positive attitudes towards Animal Science as a learning area
3.3 apply competences in solving animal science related problems
3.4 appreciate innovativeness in the sustainable utilization of local resources in the efficient production of livestock and wildlife
3.5 apply value addition skills in the processing and marketing of livestock and wildlife products to meet food security standards
3.6 ensure learners demonstrate desirable literacy and numeracy skills including practical competences necessary for life
3.7 prepare learners for life and work in an indigenized economy and increasingly globalised and competitive environment

4.0 SYLLABUS OBJECTIVES

By the end of the learning phase learners should be able to:

4.1 demonstrate an understanding of the importance of animal science in socio-economic development
4.2 apply scientific principles in livestock and wildlife production
4.3 evaluate resources necessary for the production of livestock and wildlife in animal science
4.4 demonstrate an understanding of livestock and wildlife protection principles
4.5 demonstrate the sustainable utilisation of local resources in animal production
4.6 efficiently produce and market livestock and wildlife
4.7 add value and market to livestock and wildlife products
4.8 design and carry-out research work on animal production for economic development of the nation
4.9 prepare and implement a sustainable livestock or wildlife project plan
5.0 METHODOLOGY AND TIME ALLOCATION

5.1 METHODOLOGY

Learner-centred and hands on approaches should be used in the development of concepts and skills. These approaches should be inclusive and encourage curiosity as well as promote practical-orientated learning. Emphasis should be placed on equipping learners with research skills. Linkage between theory and practice should be implemented in the teaching and learning of Animal Science.

The following are suggested methods of teaching and learning of Animal Science.

- Discussions
- Demonstrations
- Experimentation
- Problem-solving
- Project-based learning
- Research
- E-learning
- Educational tours
- Specimen collections
- Debates
- Seminars
- Design-based learning
- Survey
- Simulation and modelling

5.2 TIME ALLOCATION

Two hours per week should be allocated though more time can be created by students to adequately cover the syllabus. Learners should be engaged in at least two educational tours per year, one exhibition per year, one seminar per term and work related experience of two weeks in animal production industry.
6.0 TOPICS

1. Background to animal science
2. Anatomy and physiology
3. Nutrition
4. Genetics and breeding
5. Animal health
6. Animal production
7. Animal products and technology
### 7.0 SCOPE AND SEQUENCE

#### 7.1 TOPIC 1: BACKGROUND TO ANIMAL SCIENCE

<table>
<thead>
<tr>
<th>TOPIC</th>
<th>LEVEL III</th>
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</thead>
<tbody>
<tr>
<td>Livestock and wild animals</td>
<td>• Socio-economic importance</td>
</tr>
<tr>
<td></td>
<td>• Classification of animals</td>
</tr>
</tbody>
</table>

#### 7.2 TOPIC 2: ANATOMY AND PHYSIOLOGY

<table>
<thead>
<tr>
<th>TOPIC</th>
<th>LEVEL III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal cell Biology</td>
<td>• Cell components</td>
</tr>
<tr>
<td></td>
<td>-structure</td>
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<tr>
<td></td>
<td>-functions</td>
</tr>
<tr>
<td>Body structure</td>
<td>• Endoskeletal system of mammals</td>
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<tr>
<td></td>
<td>• Endoskeletal system of birds</td>
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<td></td>
<td>• Skeletal Joints</td>
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<td></td>
<td>• Muscles</td>
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<tr>
<td>Circulatory system and endocrinology</td>
<td>• Circulatory organs</td>
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<td></td>
<td>• Circulatory Tissues</td>
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<td></td>
<td>• Lymph system</td>
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<td></td>
<td>• Hormonal system</td>
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<tr>
<td>Respiratory system</td>
<td>• Structure</td>
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<td></td>
<td>• Function</td>
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<tr>
<td>Digestive system</td>
<td>• Types</td>
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<td></td>
<td>• Structure</td>
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<td></td>
<td>• Functions</td>
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<tr>
<td></td>
<td>• Absorption of nutrients in the body</td>
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<tr>
<td>Urinary system</td>
<td>• Structure</td>
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<tr>
<td>TOPIC</td>
<td>LEVEL III</td>
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</tr>
<tr>
<td>Reproductive system</td>
<td>• Structure</td>
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<td></td>
<td>- Male</td>
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<td></td>
<td>- Female</td>
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<tr>
<td></td>
<td>• Functions</td>
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</tbody>
</table>

### 7.3 TOPIC 3: NUTRITION

<table>
<thead>
<tr>
<th>TOPIC</th>
<th>LEVEL III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feedstuffs</td>
<td>• Classification of feedstuffs</td>
</tr>
<tr>
<td></td>
<td>• Uses of feedstuffs</td>
</tr>
<tr>
<td></td>
<td>• Feed composition</td>
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<td></td>
<td>• Digestibility</td>
</tr>
<tr>
<td></td>
<td>• Feed formulation</td>
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<tr>
<td>Nutrients</td>
<td>• Bio-chemistry of nutrients <strong>Energy</strong> metabolism</td>
</tr>
</tbody>
</table>

### 7.4 TOPIC 4: GENETICS AND BREEDING

<table>
<thead>
<tr>
<th>TOPIC</th>
<th>LEVEL III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principles of genetics</td>
<td>• Chromosomes</td>
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<td>• DNA and replication</td>
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<td></td>
<td>• Mitosis</td>
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<td></td>
<td>• Meiosis</td>
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<td></td>
<td>• Genetic code</td>
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<td></td>
<td>• Mendelian laws</td>
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<td>• Gene expressions</td>
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<tr>
<td>Breeding</td>
<td>• Breeding objectives</td>
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<td></td>
<td>• Breeding approaches</td>
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<td>• Selection systems</td>
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</table>
### 7.5 TOPIC 5: ANIMAL HEALTH

<table>
<thead>
<tr>
<th>TOPIC</th>
<th>LEVEL III</th>
</tr>
</thead>
</table>
| Health | • Environmental issues  
         • Animal diseases  
         • Animal parasites  
         • Immunity  
         • Legislation |

### 7.6 TOPIC 6: ANIMAL PRODUCTION

<table>
<thead>
<tr>
<th>TOPIC</th>
<th>LEVEL III</th>
</tr>
</thead>
</table>
| Livestock and wildlife | • Livestock and wildlife species  
                          • Importance of animals and animal products |
| Meat, Dairy and wild animal production | • Breeds  
                                          • Production systems  
                                          • Pasture and forage management |
### TOPIC 7: ANIMAL PRODUCTS AND TECHNOLOGY

<table>
<thead>
<tr>
<th>TOPIC</th>
<th>LEVEL III</th>
</tr>
</thead>
</table>
| Value addition | - Importance of value addition  
|- Processing of animal products  
|- Preservation of animal products  
| Marketing     | - Types of markets  
|- Identification of markets  
|- Marketing functions  
|- Records |
## TOPIC 1: BACKGROUND TO ANIMAL SCIENCE

<table>
<thead>
<tr>
<th>KEY CONCEPT</th>
<th>LEARNING OBJECTIVES Learners should be able to:</th>
<th>CONTENT</th>
<th>SUGGESTED ACTIVITIES AND NOTES</th>
<th>SUGGESTED RESOURCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Livestock and wild animals</td>
<td>• discuss the socio-economic importance of livestock and wild animal species and breeds&lt;br&gt;• classify livestock and wild animals&lt;br&gt;• identify breeds and their adaptive features</td>
<td>• Socio-economic importance&lt;br&gt;• Species and breeds&lt;br&gt;  - Indigenous&lt;br&gt;  - Exotic&lt;br&gt;• Adaptive features of breeds</td>
<td>• Discussing the importance of livestock and wild animal species and breeds&lt;br&gt;• Classifying livestock and wild animals&lt;br&gt;• Identifying breeds and their adaptive features</td>
<td>• Print and electronic media&lt;br&gt;• ICT tools with JAWS software&lt;br&gt;• Livestock and wild animals</td>
</tr>
</tbody>
</table>

## TOPIC 2: ANATOMY AND PHYSIOLOGY

<table>
<thead>
<tr>
<th>KEY CONCEPT</th>
<th>LEARNING OBJECTIVES Learners should be able to:</th>
<th>CONTENT</th>
<th>SUGGESTED ACTIVITIES AND NOTES</th>
<th>SUGGESTED RESOURCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal cell biology</td>
<td>• Identify the parts of an animal cell&lt;br&gt;• describe the parts of an animal cell as seen under an electron microscope&lt;br&gt;• explain the functions of the cell components</td>
<td>• Structure of the animal cell&lt;br&gt;• Functions of the cell components:&lt;br&gt;  - membrane&lt;br&gt;  - cytoplasm&lt;br&gt;  - nucleus&lt;br&gt;  - golgi body&lt;br&gt;  - endoplasmic reticulum&lt;br&gt;  - ribosomes&lt;br&gt;  - mitochondrion&lt;br&gt;  - lysosome</td>
<td>• Drawing and labelling the animal cell&lt;br&gt;• Viewing slides showing animal cells&lt;br&gt;• Preparing animal cell slides&lt;br&gt;• Identifying cell parts and structures&lt;br&gt;• Describing functions of cell components</td>
<td>• Print and electronic media&lt;br&gt;• ICT tools with JAWS software&lt;br&gt;• Slides&lt;br&gt;• Animal tissues&lt;br&gt;• Microscope&lt;br&gt;• Bio-viewers</td>
</tr>
<tr>
<td>KEY CONCEPT</td>
<td>LEARNING OBJECTIVES (Learners should be able to)</td>
<td>CONTENT</td>
<td>SUGGESTED ACTIVITIES AND NOTES</td>
<td>SUGGESTED RESOURCES</td>
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</tbody>
</table>
| **Endoskeletal system of birds** | • identify endoskeletal parts of a bird  
  • describe the functions of endoskeletal parts of a bird | • Structure  
  • Functions of parts | • Identifying parts of a bird endoskeleton  
  • Discussing the functions of endoskeletal parts of a bird | • Bird skeleton  
  • ICT tools  
  • Models |
| **Skeletal Joints**          | • describe the types of joints in mammalian endoskeleton  
  • identify how joints are connected and the material connecting them  
  • describe the functions of joints | • Types:  
  - Synovial joints  
  - Fibrous joints  
  - Amphiarthrosis  
  • Functions | describing the types of joints in mammalian endoskeleton  
  • identifying how joints are connected and the material connecting them  
  • describing the functions of joints | • ICT tools  
  • Models  
  • Samples of joints |
| **Muscular system**          | • describe the structure of the muscle  
  • identify muscles of a mammal and a bird  
  • describe the functions of the muscles on a mammal and a bird | • Structure of muscle  
  • Types of muscles:  
  - Fore and Hind quarter muscles  
  - Head, Neck and vertebrae  
  - Abdominal  
  - Respiratory  
  • Functions of muscles | Describing the structure of the muscle  
  • Identifying muscles  
  • Describing the functions of the muscles | • Muscle samples  
  • ICT tools  
  • Models |
| **Circulatory system**       | • describe the circulatory system in animals  
  • relate the structure of organs and tissues of the circulatory system to their functions  
  • describe the lymphatic system  
  • discuss the integrated functions of the organs, tissues and lymphatic system | • Circulatory organs  
  • Circulatory tissues  
  • Lymphatic system | Identifying the circulatory organs  
  • Illustrating organs of the circulatory system  
  • Describing the functions of the organs, tissues and the lymphatic systems  
  • Discussing the integrated functions of the organs, tissues and lymphatic system | • Samples of the circulatory organs  
  • ICT tools  
  • Models of circulatory system |
<table>
<thead>
<tr>
<th>KEY CONCEPT</th>
<th>LEARNING OBJECTIVES</th>
<th>CONTENT</th>
<th>SUGGESTED ACTIVITIES AND NOTES</th>
<th>SUGGESTED RESOURCES</th>
</tr>
</thead>
</table>
| **Respiratory system** | • identify parts of the respiratory system  
• describe the structure of the respiratory system  
• discuss the functions of the respiratory system | • Structure  
• Functions | • Identifying parts of the respiratory system  
• Describing the structure of the respiratory system  
• Discussing the functions of the respiratory system | • Samples of respiratory organs  
• ICT tools with JAWS software  
• Models of circulatory system |
| **Digestive system** | • describe the structure of the digestive systems  
• describe the function of each part of the digestive systems  
• explain the absorption of nutrients in the digestive systems  
• discuss factors affecting nutrient absorption | • Digestive systems  
  - Ruminant  
  - Monogastric  
• Functions of the digestive parts  
• Absorption of nutrients  
• Factors affecting nutrient absorption | • Describing the structure of the ruminant and monogastric digestive systems  
• Comparing the digestive systems  
• Describing the functions of parts of the digestive systems  
• Explaining the absorption process of nutrients in the digestive system  
• Discussing factors affecting nutrient absorption | • Samples of digestive parts  
• ICT tools with JAWS software  
• Models of digestive systems |
| **Urinary system** | • describe the parts of the urinary system  
• explain the functions of the urinary system  
• explain the relationship between structure and functions of parts of the reproductive systems  
• describe how the urinary system maintains the internal body environment of the animal | • Structure  
• Functions  
• homeostasis | • Describing the parts of the urinary system  
• Explaining the functions of the urinary system  
• describing how the urinary system maintains water, pH, osmotic pressure and electrolyte concentrations | • Samples of the urinary parts  
• ICT tools with JAWS software  
• Models |
<table>
<thead>
<tr>
<th>KEY CONCEPT</th>
<th>LEARNING OBJECTIVES</th>
<th>CONTENT</th>
<th>SUGGESTED ACTIVITIES AND NOTES</th>
<th>SUGGESTED RESOURCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reproductive system</td>
<td>Learners should be able to:</td>
<td>• Structure of:</td>
<td>• Identifying the reproductive parts</td>
<td>ICT tools with JAWS software</td>
</tr>
<tr>
<td></td>
<td>• Explain the relationship between structure and function of parts of the reproductive system</td>
<td>- Male reproductive system</td>
<td>• Describing functions of the reproductive parts</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• describe the function of the parts of the reproductive systems</td>
<td>- Female reproductive system</td>
<td>• Analysing urine and blood samples for hormonal changes</td>
<td>Models of reproductive systems</td>
</tr>
<tr>
<td></td>
<td>• discuss the role of hormones in reproduction</td>
<td>• Oogenesis</td>
<td>• Describing fertilization and embryo development</td>
<td>Samples of reproductive systems</td>
</tr>
<tr>
<td></td>
<td>• describe the disorders associated with the reproductive systems</td>
<td>• Spermatogenesis</td>
<td>• Discussing the causes of infertility in animals</td>
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<tr>
<td></td>
<td>• discuss the causes of infertility in animals</td>
<td>• Role of hormones</td>
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<td>• Fertilization and embryo development</td>
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<td>• Causes of infertility</td>
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**TOPIC 3: NUTRITION**

<table>
<thead>
<tr>
<th>KEY CONCEPT</th>
<th>LEARNING OBJECTIVES</th>
<th>CONTENT</th>
<th>SUGGESTED ACTIVITIES AND NOTES</th>
<th>SUGGESTED RESOURCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classification of feedstuffs</td>
<td>Learners should be able to:</td>
<td>• Classification:</td>
<td>• Grouping feed samples according to:</td>
<td>Recommended texts</td>
</tr>
<tr>
<td></td>
<td>• classify feedstuffs according to:</td>
<td>- Dry roughages</td>
<td>- use</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- use</td>
<td>- Forages and fodder</td>
<td>- nutritional composition</td>
<td>ICT tools with JAWS software</td>
</tr>
<tr>
<td></td>
<td>- nutritional composition</td>
<td>Silage and hay</td>
<td></td>
<td>Feed samples</td>
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<td>High energy feed</td>
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<td></td>
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<td>Protein supplements</td>
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<td>Mineral supplements</td>
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<td>Vitamin supplements</td>
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<td>Non-nutritive feed additives</td>
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<tr>
<td>Feed Composition</td>
<td>Learners should be able to:</td>
<td>• Composition</td>
<td>• Determining nutrient composition of feedstuffs through laboratory experiments</td>
<td>ICT tools with JAWS software</td>
</tr>
<tr>
<td></td>
<td>• determine nutrient composition of feedstuffs</td>
<td>• Feed quality</td>
<td>• Describing the factors</td>
<td>Feed samples</td>
</tr>
<tr>
<td></td>
<td>• describe factors that affect feed quality</td>
<td>- Anti-nutritional factors such as mycotoxins and tannins</td>
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</tr>
<tr>
<td></td>
<td>• examine the anti-nutritional factors in feeds</td>
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<tr>
<td>KEY CONCEPT</td>
<td>LEARNING OBJECTIVES Learners should be able to:</td>
<td>CONTENT</td>
<td>SUGGESTED ACTIVITIES AND NOTES</td>
<td>SUGGESTED RESOURCES</td>
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</tbody>
</table>
| Digestibility     | • differentiate true from apparent digestibility  
|                   | • describe factors affecting digestibility       
|                   | • demonstrate digestibility using in-vivo or in-vitro method  
|                   | • relate feed intake to live weight gain         
|                   | • calculate digestibility of feeds               | • Types of digestibility        
|                   |                                                | • Factors affecting digestibility   
|                   |                                                | • In-vivo and in-vitro techniques  
|                   |                                                | • Feed conversion efficiency      
|                   |                                                | • digestibility calculations      | • Discussing types of digestibility  
|                   |                                                | • Discussing factors affecting digestibility | • Demonstrating digestibility using in-vivo in-vitro method  
|                   |                                                | • Showing relationship between feed intake and weight gain  
|                   |                                                | • Educational touring to a research station to observe in-vitro | | • ICT tools with JAWS software  
|                   |                                                |                              | • Ingesta samples                   | • Feecal samples                  |
|                   |                                                |                              | • Resource person from research station and feed formulation companies |                              |
| Feed formulation  | • discuss factors to consider when formulating feed
|                   | • formulate feed for various animal groups using Pearson’s Square method and feed formulation softwares
|                   | • ensilage plants                               | • Feed formulation factors      
|                   |                                                | • Pearson’s square and feed formulating software  
|                   |                                                | • Silage making                 | • Discussing factors to consider when formulating feeds
|                   |                                                |                              | • Formulating feeds using Pearson’ square method and feed formulation software  
|                   |                                                |                              | • Making silage using grasses or legumes | • ICT tools with JAWS software  
|                   |                                                |                              |                                      | • Feed formulation software  
<p>|                   |                                                |                              |                                      | • Silage plants                  |
|                   |                                                |                              |                                      | • Molasses                        |
|                   |                                                |                              |                                      | • Resource person from feed formulation companies  |</p>
<table>
<thead>
<tr>
<th>KEY CONCEPT</th>
<th>LEARNING OBJECTIVES</th>
<th>CONTENT</th>
<th>SUGGESTED ACTIVITIES AND NOTES</th>
<th>SUGGESTED RESOURCES</th>
</tr>
</thead>
</table>
| **Bio-chemistry of nutrients**      | - describe the biochemical structures of carbohydrates, proteins and lipids  
   - relate structure to function of carbohydrates, proteins and lipids  
   - identify the effects of climate change on animal nutrient requirements | - Nutrients  
   - Carbohydrates  
   - Proteins  
   - lipids  
   - Vitamins  
   - Minerals  
   - Feed additives  
   - Effects of climate change | - Drawing the biochemical structures of carbohydrates, proteins and lipids  
   - Describing the biochemical structure of carbohydrates, proteins and lipids  
   - Explaining the relationship between the structure and function of carbohydrates, proteins and lipids  
   - Discussing the effects of climate change on animal nutrient requirements | - ICT tools with JAWS software  
   - Print media  
   - Simulation cards |
| **Energy metabolism**                | - describe glycolysis  
   - describe the importance of glycolysis to animal production  
   - describe the Krebs cycle  
   - examine the products and importance Krebs cycle interpret the diagrammatic representation of Krebs cycle  
   - describe the importance of Krebs cycle to animal production  
   - Compare glycolysis and Krebs cycle  
   - Describe ATP synthesis through oxidative phosphorylation | - Glycolytic pathway  
   - Krebs cycle  
   - Oxidative phosphorylation | - describing the glycolytic pathway  
   - examining the products and importance glycolysis  
   - interpreting the diagrammatic representation of glycolysis  
   - describing the importance of glycolysis to animal production  
   - describing the Krebs cycle  
   - examining the products and importance of the Krebs cycle interpret the diagrammatic representation of Krebs cycle  
   - describing the importance of Krebs cycle to animal production  
   - Comparing glycolysis and Krebs cycle | - ICT tools with JAWS software  
   - Print media |
### TOPIC 4: GENETICS AND BREEDING

<table>
<thead>
<tr>
<th>KEY CONCEPT</th>
<th>LEARNING OBJECTIVES Learners should be able to:</th>
<th>CONTENT</th>
<th>SUGGESTED ACTIVITIES AND NOTES</th>
<th>SUGGESTED RESOURCES</th>
</tr>
</thead>
</table>
| Principles of genetics | • describe the structure of a chromosome  
• describe the structure of DNA  
• explain DNA replication  
• describe the process of mitosis  
• explain the significance of mitosis in animal production  
• describe the process of meiosis  
• explain the significance of meiosis in animal reproduction  
• compare and contrast mitosis and meiosis  
• outline Mendelian laws of inheritance  
• describe protein synthesis starting from DNA  
• outline types of gene expression | • Chromosomes  
• DNA and replication  
• Mitosis:  
  - Phases  
  - Significance  
• Meiosis:  
  - Phases  
  - Significance  
• Comparison of mitosis and meiosis  
• Mendelian laws  
• Protein synthesis | • Discussing the structure of a chromosome.  
• Constructing chromosome model.  
• Explaining DNA replication  
• Illustrating the structure of DNA  
• Describing mitotic cell division  
• Discussing significance of mitosis  
• Describing meiotic cell division  
• Outlining significance of meiosis in animal reproduction  
• Outlining the differences between mitosis and meiosis  
• Explaining the law of independent assortment  
• Describing the law of segregation  
• Identifying characteristics of sex-linked inheritance | • Print and electronic media  
• Video clips  
• ICT tools  
• JAWS software  
• Simulation cards  
• Animal breeders  
• Resource personnel |
<table>
<thead>
<tr>
<th>KEY CONCEPT</th>
<th>LEARNING OBJECTIVES</th>
<th>CONTENT</th>
<th>SUGGESTED ACTIVITIES AND NOTES</th>
<th>SUGGESTED RESOURCES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Learners should be able to:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• describe effects of environment on gene expression</td>
<td>• Gene expression:</td>
<td>• Describing protein synthesis starting from DNA</td>
<td>Video clips</td>
</tr>
<tr>
<td></td>
<td>• determine genotype and phenotype ratios</td>
<td>- Dominance</td>
<td>• Comparing dominance and co-dominance</td>
<td>ICT tools and JAWS software</td>
</tr>
<tr>
<td></td>
<td>• describe the importance of gene expression</td>
<td>- Co-dominance</td>
<td>• Determining genotype and phenotype using genetic diagrams</td>
<td>Simulation cards</td>
</tr>
<tr>
<td></td>
<td>• describe types of mutation</td>
<td>- Partial dominance</td>
<td>• Describing the effects of environment on gene expression</td>
<td>Animal breeders</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Over dominance</td>
<td>• Describing gene mutation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Gene-environment interaction</td>
<td>• Describing types and effects of mutations</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>- Epistasis</td>
<td>• Designing and carrying out experiments on crossing different breeds of animals</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>• Gene mutations</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>• Chromosomal mutations</td>
<td></td>
<td></td>
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<tr>
<td>Breeding</td>
<td>• discuss objectives of animal breeding</td>
<td>• Breeding objectives</td>
<td>• discussing objectives of animal breeding</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• outline breeding approaches in animal production</td>
<td>• Breeding approaches</td>
<td>• outlining breeding approaches in animal production</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• describe selection systems in animal breeding</td>
<td>• Selection systems:</td>
<td>• describing selection systems in animal breeding</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• discuss merits and demerits of animal selection</td>
<td>- Natural</td>
<td>• discussing merits and demerits of animal selection</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• discuss animal improvement programmes</td>
<td>- Artificial</td>
<td>• discussing animal improvement programs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• discuss the implications of genetic engineering in livestock production</td>
<td>• Improvement programmes:</td>
<td>• discussing the implications of genetic engineering in livestock production</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• describe different mating systems in animal production</td>
<td>- Cross-breeding</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>- Out-breeding</td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>- In-breeding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KEY CONCEPT</td>
<td>LEARNING OBJECTIVES</td>
<td>CONTENT</td>
<td>SUGGESTED ACTIVITIES AND NOTES</td>
<td>SUGGESTED RESOURCES</td>
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</tbody>
</table>
|            | Learners should be able to: | - Up-grading  
- Back-crossing  
- Genetic engineering  
- Mating systems:  
  - Natural  
  - Artificial | describing different mating systems in animal production | |
|            |                     |         |                               |                     |
| TOPIC 5: ANIMAL HEALTH | | | | |
| KEY CONCEPT | LEARNING OBJECTIVES | CONTENT | SUGGESTED ACTIVITIES AND NOTES | SUGGESTED RESOURCES |
| Factors that influence animal diseases | • outline the factors that cause diseases in animals  
• discuss strategies to combat spread of diseases | • Environmental factors  
  - Temperature  
  - Humidity  
  - Moisture  
  - Hygiene  
  - Pathogenic organisms:  
    - Bacteria  
    - Viruses  
    - Protozoa  
    - rickettsia  
  - Nutritional deficiencies  
  - Integrated disease management activities | Providing suitable structures to modify environmental factors  
Measuring environmental factors to assess variation  
Discussing disease causing organisms  
Describing nutritional deficiency diseases  
Discussing strategies to combat disease out-break | Thermometers  
ICT tools and JAWS software |
| Animal diseases | • discuss causes and transmission of diseases  
• describe signs and symptoms of diseases  
• describe prevention and control measures of notifiable diseases | • Bacterial diseases  
  - Anthrax  
  - Infectious Bursal Disease (IBD)  
  - Black leg  
  - Contagious abortion  
• Viral diseases | Discussing causes and transmission of diseases  
Describing signs and symptoms of diseases  
Describing prevention and control measures of diseases  
Carrying-out disease diagnosis | Print and electronic media  
Resource person  
Veterinary reports |
<table>
<thead>
<tr>
<th>KEY CONCEPT</th>
<th>LEARNING OBJECTIVES Learners should be able to:</th>
<th>CONTENT</th>
<th>SUGGESTED ACTIVITIES AND NOTES</th>
<th>SUGGESTED RESOURCES</th>
</tr>
</thead>
</table>
| Animal parasites | • describe external and internal parasites • relate parasites to the damage they cause • describe methods of controlling parasites | New castle  
- Foot and mouth  
- Lumpy skin  
• Protozoan  
- Red water  
- Trypanosomiasis/nagana  
- Coccidiosis  
• Rickettsia disease  
- Heart water  
(Learners should study one bacteria, one virus, one protozoa and one rickettsia) | and post-mortem | Field work  
- Dung samples  
- Samples of parasites  
- Veterinary officer |
| Immunity | • Describe natural and artificial immunity • discuss the importance of immunity to animals • describe the role of lymph nodes in immunity • describe immune cell types | Types of immunity:  
Natural  
- Passive  
- Active  
Artificial  
- Passive  
- Active  
• Role of lymph nodes | Describing natural and artificial immunity  
Discussing the importance of immunity to animals  
Feeding colostrum to young animals  
Vaccinating animals against various diseases | Print and electronic media  
- ICT tools with JAWS software  
- Vaccines  
- Veterinary officer |
<table>
<thead>
<tr>
<th>KEY CONCEPT</th>
<th>LEARNING OBJECTIVES</th>
<th>CONTENT</th>
<th>SUGGESTED ACTIVITIES AND NOTES</th>
<th>SUGGESTED RESOURCES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Learners should be able to:</td>
<td></td>
<td></td>
<td>officer</td>
</tr>
<tr>
<td></td>
<td>• Immune cell types</td>
<td>• Drawing and labelling lymph nodes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Describing the role of lymph nodes in immunity</td>
<td>• Discussing types of immune cell</td>
<td></td>
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</tr>
<tr>
<td>Legislation</td>
<td>• discuss legal responsibilities of livestock owners</td>
<td>• Animal Health ACT</td>
<td>• Discussing regulations governing notifiable diseases (transferable from animals to human beings)</td>
<td>• Print and electronic media</td>
</tr>
<tr>
<td></td>
<td>• outline notifiable disease regulations</td>
<td></td>
<td>• Touring veterinary department</td>
<td>• ICT tools and JAWS software</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Animal Health ACT</td>
</tr>
</tbody>
</table>

**TOPIC 6: ANIMAL PRODUCTION**

<table>
<thead>
<tr>
<th>KEY CONCEPT</th>
<th>LEARNING OBJECTIVES</th>
<th>CONTENT</th>
<th>SUGGESTED ACTIVITIES AND NOTES</th>
<th>SUGGESTED RESOURCES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Learners should be able to:</td>
<td></td>
<td></td>
<td>animal products such as meat, milk, hides, trophy, horns</td>
</tr>
<tr>
<td></td>
<td>• describe livestock and wild animal species</td>
<td>• Breeds used in agriculture</td>
<td>• Describing livestock and wild animal species</td>
<td>ICT tools with JAWS software</td>
</tr>
<tr>
<td></td>
<td>• explain the importance of animals and animal products</td>
<td>• End products</td>
<td>• Explaining the importance of animals and animal products</td>
<td>• Farm and wild animals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Socio-economic importance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Livestock and wild animals</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• describe characteristics of meat, dairy and wild animals</td>
<td>• characteristics: -livestock breeds -Wild animals</td>
<td>• Describing characteristics of meat, dairy and wild animals</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• select livestock breeds which suit the local environment</td>
<td></td>
<td>• Viewing multimedia showing different breeds of animals</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• describe the suitable habitat for wild animals</td>
<td></td>
<td>• describing the suitable habitat for wild animals</td>
<td></td>
</tr>
<tr>
<td>Meat, dairy and wild animal production</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KEY CONCEPT</td>
<td>LEARNING OBJECTIVES</td>
<td>CONTENT</td>
<td>SUGGESTED ACTIVITIES AND NOTES</td>
<td>SUGGESTED RESOURCES</td>
</tr>
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</tbody>
</table>
|             | Learners should be able to: | *Learners should study one animal from the following groups:*  
  *group 1* meat - cattle, sheep, goats and pigs;  
  *group 2* dairy - cattle, sheep and goats  
  *group 3* wild animals – big five | • Conducting educational tours to farms, exhibition parks and national parks | ICT tools with JAWS software |
| Production systems | • describe production systems  
  • discuss factors that influence the choice of a production system | • Production systems:  
  - Intensive  
  - Extensive  
  • Factors to consider in choosing production system | • Describing production systems  
  • Discussing factors that influence the choice of a production system  
  • Conducting educational tours to farms | |
| Pasture management | • describe pasture management practices  
  • explain measures of improving pastures | • Pasture management practices  
  • Methods of improving pastures | • Describing pasture management  
  • Explaining measures of improving pastures  
  • Planting pasture grasses and fodder legumes  
  • Conducting educational tours on pastures  
  • Carrying out veld assessment | ICT tools with JAWS software  
  • Pasture lands  
  • Pasture grasses and legume fodder seeds |
| Management Practices | • describe management practices of beef, dairy and wild animals  
  • justify feed requirements for different classes of animals  
  • describe the management practices of | • Management Practices:  
  - Dehorning  
  - Weaning  
  - Castration  
  - Vaccination  
  - Culling  
  - Naval dipping  
  - Iron injection | • Describing management practices of beef, dairy and wild animals  
  • Justifying feed requirements for different classes of animals  
  • Describing the management practices of different classes of animals | ICT tools with JAWS software  
  • Farm animals  
  • Milking parlours |
<table>
<thead>
<tr>
<th>KEY CONCEPT</th>
<th>LEARNING OBJECTIVES</th>
<th>CONTENT</th>
<th>SUGGESTED ACTIVITIES AND NOTES</th>
<th>SUGGESTED RESOURCES</th>
</tr>
</thead>
</table>
| different classes of animals | Learners should be able to: | - Pregnancy diagnosis  
- Eye tooth removal  
- Provision of warmth  
- Classes from birth to marketing  
- Milking facilities  
- Factors influencing milk production and quality: - Hormones  
- Stimuli  
- Diet  
- Frequency  
- Diseases  
- Hygiene | - Educational touring to livestock farms and game parks  
- Observing the milking process  
- Explaining milk handling and storage facilities  
- Discussing factors that affect milk let-down  
- Identifying factors that affect product quality  
- Carrying-out the milking process | |
| Handling facilities | • describe the structure of animal handling facilities  
• relate the structure and design to purpose of handling facilities  
• maintain the handling facilities | • Handling facilities: - paddocks  
- crush pens  
- spray races  
- farrowing racks  
- loading ramp | • Constructing handling facilities such as: - crush pens  
- paddocks  
- farrowing racks  
- Relating the structure to purpose  
- maintaining the handling facilities  
- Educational touring of local handling facilities | • ICT tools with JAWS software  
• Handling facilities |
| Farm records | • prepare farm records  
• maintain farm records  
• evaluate farm records | • Physical records  
• Financial records | • Compiling physical and financial records  
• Maintaining physical and financial records  
• Evaluating farm records  
• Debating on the viability of school or community based enterprises | • Farm records |
## TOPIC 7: ANIMAL PRODUCTS AND TECHNOLOGY

<table>
<thead>
<tr>
<th>KEY CONCEPT</th>
<th>LEARNING OBJECTIVES Learners should be able to:</th>
<th>CONTENT</th>
<th>SUGGESTED ACTIVITIES AND NOTES</th>
<th>SUGGESTED RESOURCES</th>
</tr>
</thead>
</table>
| **Value addition**           | • describe the processes of value addition in animal products  
  • Identify value addition mechanisms  
  • discuss the importance of value addition in animal products | • Value addition  
  • Importance of value addition | • Discussing value addition processes  
  • Identifying value addition mechanisms  
  • Discussing the importance of value addition | • ICT tools with JAWS software  
  • Animal products  
  • Print and electronic media |
| **Processing of Animal products** | • identify meat, dairy and wildlife products  
  • describe the historical view of production, trade and consumption of meat, dairy and wildlife products  
  • demonstrate the processing of meat, dairy and wildlife products  
  • evaluate food safety and the Hazard Analysis and Critical Control points (HACC) | • meat products  
  • dairy products  
  • wildlife products  
  • historical concept of food processing in Zimbabwe  
  • Food processing technology  
  • Non-food processing technology | • Identifying animal products  
  • Discussing the impact of major technological innovations in the history of food and non-food processing  
  • Designing technology for processing animal products  
  • Processing animal products | • ICT tools with JAWS software  
  • Animal products  
  • Dairy Zimbabwe  
  • Abattoirs wildlife |
| **Preservation of animal products** | • discuss the importance of preservation  
  • Identify preservation methods of animal products  
  • demonstrate preservation of animal products  
  • evaluate the preservation methods in their local area | • Preservation  
  - Importance  
  - Methods | • Discussing the importance of preservation  
  • Identifying preservation methods of animal products  
  • Demonstrating preservation of animal products  
  • Evaluating the preservation methods in their locality | • ICT tools with JAWS software  
  • Animal products |
| **Types of markets**          | • describe types of markets for livestock and wildlife products                                                    | • Markets for livestock and wildlife and their products:  
  - Describing markets of livestock and wildlife and | • ICT tools with JAWS |


<table>
<thead>
<tr>
<th>KEY CONCEPT</th>
<th>LEARNING OBJECTIVES</th>
<th>CONTENT</th>
<th>SUGGESTED ACTIVITIES AND NOTES</th>
<th>SUGGESTED RESOURCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market functions</td>
<td>Learners should be able to:</td>
<td>• compare the markets of livestock and wildlife products</td>
<td>• Processing companies -Private - Abattoirs -Auctions -On Farm</td>
<td>their products • Comparing the markets for livestock and wildlife products • Touring market centres</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• describe the factors for price determination</td>
<td>• Marketing mix: - Price - Product - Promotion - Place - Processes - people</td>
<td>• Describing the factors for price determination • Determining the factors that influence quality of livestock and wildlife products • Describing the different promotion methods for livestock and wildlife products • Conducting market survey for livestock and wildlife products • Educational touring to exhibition parks</td>
</tr>
</tbody>
</table>
Animal Science learning area will be assessed through continuous and summative assessment.

Assessment of learner performance in Animal Science 100%

Continuous assessment 30%

- Experiments 8%
- Production Projects 10%
- Theory Assignments 5%

Summative Assessment 70%

- Paper 1 10%
- Paper 2 35%
- Paper 3 10%

Profiling

Continuous Assessment Mark = 30%

Examination Mark = 70%

FINAL MARK Animal Science 100%
ASSessment OBJECTIVES

Learners will be assessed on their ability to demonstrate knowledge and understanding, application of knowledge and experimental skills

Knowledge and understanding

- discuss, describe, identify and demonstrate specific animal science facts, principles, relationships, concepts, practical techniques and terminology
- summarise and explain any given animal science information

Application of knowledge

- illustrate, interpret, solve and criticize specific phenomena of animal science
- schedule, test and experiment, using animal science facts and principles
- compare, contrast and criticise any procedures, processes and techniques employed in animal science

Experimental skills

- design and develop experimental activities in animal science
- report, illustrate and interpret observations correctly
- assess and justify methods of production employed in animal science
- compose, construct and organise given animal science facts into diagrams, tables and graphs
- analyse, interpret and evaluate results from any given animal science activity

Skills Specification Grid

<table>
<thead>
<tr>
<th>ASSESSMENT SKILL</th>
<th>PAPER 1</th>
<th>PAPER 2</th>
<th>PAPER 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge with understanding</td>
<td>50</td>
<td>40</td>
<td>15</td>
</tr>
<tr>
<td>-------------------------------</td>
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</tr>
<tr>
<td>Application of knowledge</td>
<td>30</td>
<td>40</td>
<td>35</td>
</tr>
<tr>
<td>Experimental skills</td>
<td>20</td>
<td>20</td>
<td>50</td>
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<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
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</table>

**ASSESSMENT**

<table>
<thead>
<tr>
<th>ASSESSMENT COMPONENT</th>
<th>WEIGHTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous assessment</td>
<td>30%</td>
</tr>
<tr>
<td>Summative assessment</td>
<td>70%</td>
</tr>
</tbody>
</table>

**CONTINUOUS ASSESSMENT**

Assessment will be done through
- Theory Assignments: 5%
- Tests: 7%
- Production Projects: 10%
- Experimental Tests: 8%

<table>
<thead>
<tr>
<th>ASSESSMENT MODE</th>
<th>LEVEL III WEIGHTING</th>
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</thead>
<tbody>
<tr>
<td>Theory assignment</td>
<td>5%</td>
</tr>
<tr>
<td>Tests</td>
<td>7%</td>
</tr>
<tr>
<td>Production Project</td>
<td>10%</td>
</tr>
<tr>
<td>Experimental tests</td>
<td>8%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ASSESSMENT MODE</th>
<th>FREQUENCY PER LEVEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory assignments</td>
<td>2 per year</td>
</tr>
<tr>
<td>Tests</td>
<td>2 per year</td>
</tr>
<tr>
<td>Production projects</td>
<td>2 for the 2 levels</td>
</tr>
<tr>
<td>Experimental tests</td>
<td>2 per year</td>
</tr>
</tbody>
</table>
SUMMATIVE ASSESSMENT 70%

Learners are required to take papers 1 to 3.

<table>
<thead>
<tr>
<th>PAPER DESCRIPTION</th>
<th>DURATION</th>
<th>MARKS</th>
<th>WEIGHTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper 1</td>
<td>1 hour</td>
<td>40</td>
<td>10%</td>
</tr>
<tr>
<td>Paper 2</td>
<td>2 hours 30mins</td>
<td>100</td>
<td>35%</td>
</tr>
<tr>
<td>Paper 3</td>
<td>2 hours</td>
<td>40</td>
<td>10%</td>
</tr>
</tbody>
</table>

PAPER 1
Consists of multiple choice questions from the whole syllabus. Candidates will be required to answer all 40 questions. Total marks (40)

PAPER 2
This is a structured free response paper which has 2 sections namely A and B. Both sections are set from any part of the syllabus key concepts.

SECTION A
Candidates are required to answer all questions in this section. Six questions will be set, each question is carries 10 marks
Section total 60 marks

SECTION B
Essay type questions will be set from any part of the syllabus. Four questions will be set and candidates will be required to answer any 2 questions. Each question carries 20 marks.
Section total (40)
Paper total (100)

PAPER 3
A practical examination will be set from any part of the syllabus. The paper will be based on experiments, investigations, observations and calculations. Full instructions will be given where unfamiliar material or techniques are required. Two compulsory questions are set, each question carries 20 marks.
Paper total (40)

10 APPENDICES
For a learning centre to take up this subject the following should be available:
• One the animals being studied
• Equipment- dehorning, castration, detoother
• Animal handling facilities
• E-learning facilities
• Models of animal anatomy
• Skeletal systems
• Protective clothing
• Health equipment – dosing gun, injection needles and syringes, sprayers.