This memorandum consists of 9 pages.
PRINCIPLES RELATED TO MARKING LIFE SCIENCES

1. **If more information than marks allocated is given**
   Stop marking when maximum marks is reached and put a wavy line and 'max' in the right-hand margin.

2. **If, for example, three reasons are required and five are given**
   Mark the first three irrespective of whether all or some are correct/incorrect.

3. **If whole process is given when only a part of it is required**
   Read all and credit the relevant part.

4. **If comparisons are asked for but descriptions are given**
   Accept if the differences/similarities are clear.

5. **If tabulation is required but paragraphs are given**
   Candidates will lose marks for not tabulating.

6. **If diagrams are given with annotations when descriptions are required**
   Candidates will lose marks.

7. **If flow charts or diagrams are given instead of descriptions**
   Candidates will lose marks.

8. **If sequence is muddled and links do not make sense**
   Where the sequence and links are correct, credit. Where sequence and links are incorrect, do not credit. If sequence and links become correct again, resume credit.

9. **Non-recognised abbreviations**
   Accept if first defined in answer. If not defined, do not credit the unrecognised abbreviation but credit the rest of the answer if correct.

10. **Wrong numbering**
    If answer fits into the correct sequence of questions but the wrong number is given, it is acceptable.

11. **If language used changes the intended meaning**
    Do not accept.

12. **Spelling errors**
    If recognisable, accept the answer, provided it does not mean something else in Life Sciences or if it is out of context.

13. **If common names are given in terminology**
    Accept, provided it was accepted at the national memo discussion meeting.

14. **If only the letter is asked for but only the name is given (and vice versa)**
    Do not credit.
15. **If units are not given in measurements**
Candidates will lose marks. Memorandum will allocate marks for units separately.

16. **Be sensitive to the sense of an answer, which may be stated in a different way.**

17. **Caption**
All illustrations (diagrams, graphs, tables, etc.) must have a caption.

18. **Code-switching of official languages (terms and concepts)**
A single word or two that appear(s) in any official language other than the learners' assessment language used to the greatest extent in his/her answers should be credited if it is correct. A marker that is proficient in the relevant official language should be consulted. This is applicable to all official languages.

19. **Changes to the memorandum**
No changes must be made to the memoranda without consulting the provincial internal moderator who in turn will consult with the national internal moderator (and the Umalusi moderators where necessary).

20. **Official memoranda**
Only memoranda bearing the signatures of the national internal moderator and the Umalusi moderators and distributed by the national Department of Basic Education via the provinces must be used.
SECTION A

QUESTION 1

1.1  1.1.1  D✓✓
     1.1.2  D✓✓
     1.1.3  C✓✓
     1.1.4  C✓✓
     1.1.5  D✓✓
     1.1.6  B✓✓
     1.1.7  B✓✓
     1.1.8  B✓✓
     1.1.9  D✓✓
     1.1.10 A✓✓  (10 x 2)  (20)

1.2  1.2.1  Complete dominance✓
     1.2.2  Cloning✓
     1.2.3  Population✓
     1.2.4  Stereoscopic✓/Binocular
     1.2.5  Hominidae✓/Hominids
     1.2.6  Down syndrome✓/trisomy 21
     1.2.7  Transcription✓
     1.2.8  Homologous✓
     1.2.9  Locus✓
     1.2.10 Discontinuous variation✓  (10 x 1)  (10)

1.3  1.3.1  Both A and B✓✓
     1.3.2  Both A and B✓✓
     1.3.3  B only✓✓  (3 x 2)  (6)

1.4  1.4.1  (a) Big✓ and green✓ fruit  (2)
      (b) BG, Bg, bG, bg✓✓  (2)
     1.4.2  0✓ %✓  (2)

1.5  1.5.1  W  Cell membrane✓/Plasmalemma  (1)
      X  Homologous chromosomes✓/Bivalent  (1)
     1.5.2  (a)  4✓  (1)
      (b)  2 ✓  (1)
     1.5.3  D✓  (1)
     1.5.4  Y  Holds the sister chromatids together✓  (2)
      Z  Pulls chromosomes/chromatids to the poles✓
     1.5.5  Telophase II✓

TOTAL SECTION A:  (8)  [50]
SECTION B

QUESTION 2

2.1 2.1.1 (11/100) √ x 2000 √ = 220 √  

2.1.2 - Repeat √ the investigation 
- Use a larger sample size √ /more dogs  
(Mark first TWO only)  

2.1.3 The breed of the dogs √  
(Mark first ONE only)  

2.1.4 - The disorders are inherited √ 
- and therefore does not change with age √  

2.1.5 Autosomal recessive inheritance causes most of the genetic disorders in dogs √  

2.2.  
P₁ Phenotype Rough hair x Smooth hair √  
Genotype Hh x hh √  

Meiosis  
G/gametes H h x h h √  

Fertilisation  
F₁ Genotype Hh Hh hh hh √  
Phenotypic ratio 1 rough hair : 1 smooth hair √  
P₁ and F₁ √  
Meiosis and fertilisation √  

OR  
P₁ Phenotype Rough hair x Smooth hair √  
Genotype Hh x hh √  

Meiosis  
Gametes H h  
h Hh hh  
h Hh hh  

1 mark for correct gametes 
1 mark for correct genotypes 

F₁ Phenotypic ratio 1 rough hair : 1 smooth hair √  
P₁ and F₁ √  
Meiosis and fertilisation √  

(6)
2.3  
2.3.1 (a) DNA ✓
(b) Ribosome ✓

2.3.2 (a) 2 ✓
(b) 5 ✓
(c) 7 ✓

2.3.3 - The mRNA attaches to the ribosome ✓
- When each codon ✓ of the mRNA
- matches with the anticodon ✓ on the tRNA
- the tRNA brings the required amino acid to the ribosome ✓
- When the different amino acids are brought in sequence ✓
- adjacent amino acids are linked by peptide bonds ✓
- to form the required protein ✓ / polypeptide Any 4

2.3.4 (a) CCT ✓✓
(b) CCU ✓✓

2.3.5

<table>
<thead>
<tr>
<th>DNA</th>
<th>RNA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has deoxyribose ✓ sugar</td>
<td>Has ribose ✓ sugar</td>
</tr>
<tr>
<td>Has nitrogen base thymine(T) ✓ / A, C, G and T</td>
<td>Has nitrogen base uracil(U) ✓ / A, C, G and U</td>
</tr>
</tbody>
</table>

(Mark first TWO only) (2 x 2)
TABLE NOT REQUIRED

2.4.1 Embryos ✓ / Blastocysts
Umbilical cord ✓ / Placenta
Bone marrow ✓
(Mark first ONE only) Any 1

2.4.2 - Stem cells are undifferentiated ✓
- and have the potential to develop into any type of cell ✓
- to replace the affected / defective cells ✓ causing the disorder (3)

2.4.3 - To produce ova ✓ which could be used
- in cases where females do not have functional ovaries ✓
- and are therefore infertile ✓ and thereby
- allowing them to have children ✓ Any 3
QUESTION 3

3.1  3.1.1 - The DNA molecule unwinds✓
- Hydrogen bonds between the two strands break✓/ the molecule unzips
- Each strand serves as a template✓
- Free nucleotides✓ attach to the individual strands
- With complementary nitrogen bases✓ pairing
- Two identical DNA molecules✓ are formed
- Process is controlled by enzymes✓  Any 5  (5)

3.1.2 - If the incorrect nitrogen base✓ attaches to the original strand/if a nitrogen base is added or deleted
- The sequence✓/order of the bases changes on the new DNA molecule
- Resulting in a change in the gene structure✓  Any 2  (2)

3.2  3.2.1 ‘Out of Africa’ hypothesis✓  (1)

3.2.2 Mitochondrial DNA✓/mtDNA  (1)

3.2.3 - The mitochondrial DNA is only inherited from the mother✓
- Any mutation✓ on this DNA
- Can be traced✓ along the maternal line only  (3)

3.2.4 Fossil evidence✓
Archaeological evidence✓  Any 1  (1)

(Mark first ONE only)  (6)

3.3 - A population of a species becomes separated✓ by a geographical barrier
- Then the population splits into different populations✓
- There is no gene flow✓ between the populations
- Each population may be exposed to different environmental conditions✓
- Natural selection occurs independently✓ in each population
- The individuals of each population become different from each other✓ over time
- Genotypically and phenotypically✓
- Even if the two populations were to mix again✓
- They would not be able to reproduce with each other✓ and are thus different species  Any 6  (6)
3.4.1 X - Foramen magnum✓
         Y - Canine✓

3.4.2 - The foramen magnum is located in a more forward position✓ below the skull
      - showing that organism C is bipedal✓
      - This allows for the vertebral column/spine to extend vertically✓ from the base of the skull
      - to balance the body weight in upright walking✓

3.4.3 (a) B✓
      (b) A✓

3.4.4 - There is an increase✓ in the cranium size✓ from organism B to organism C
      - This will allow it to house a larger brain✓ /cerebrum which suggests greater intelligence

3.4.5

<table>
<thead>
<tr>
<th>Skull B</th>
<th>Skull C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brow ridges pronounced✓</td>
<td>Brow ridges are not as pronounced✓</td>
</tr>
<tr>
<td>More protruding jaws✓ / larger jaws</td>
<td>Less protruding jaws✓ / smaller jaws</td>
</tr>
</tbody>
</table>

(Mark first TWO only)

Table 1 + (2 x 2)

3.5 3.5.1 - Because they were normal they must each have one dominant allele✓
         - and in order for their children to be affected each parent must have one recessive allele✓

3.5.2 NN✓ or Nn✓

3.5.3 - The father would have been affected✓ if it was sex-linked
         - in order for the daughter to be affected✓

TOTAL SECTION B: 80
SECTION C

QUESTION 4

Lamarckism
- The ancestral elephant stretched its proboscis ✓
- to get leaves ✓ in trees/further from the body
- The more it used the proboscis ✓, the longer it became ✓
- The offspring then inherited the acquired longer proboscis ✓
- Over many generations the length of the proboscis increased ✓
- until it became a trunk ✓ as in the modern elephant Any 5 (5)

Darwinism
- There was a great deal of genetic variation ✓ amongst the offspring
- Some had long proboscis ✓
- and some had short proboscis ✓
- There was a change in environmental conditions ✓/competition amongst the animals for food
- They had to reach higher in the trees to get leaves ✓
- The animals with shorter proboscis died ✓
- Those individuals with the longer proboscis survived ✓
- They then reproduced ✓
- and passed on this characteristic to their offspring ✓
- The next generation of animals had a greater proportion ✓ of animals with longer proboscis Any 9 (9)

Artificial selection
- Humans ✓ select the elephants with desirable characteristics ✓/long trunk
- and mate them to produce offspring with longer trunks ✓
- Those that are pure breeding ✓ for long trunks
- are further selected to mate to produce offspring with further longer trunks ✓ Any 3 (3)

ASSESSING THE PRESENTATION OF THE ESSAY

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Relevance (R)</th>
<th>Logical sequence (L)</th>
<th>Comprehensive (C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generally</td>
<td>All information provided is relevant to the question</td>
<td>Ideas are arranged in a logical/cause-effect sequence</td>
<td>All aspects required by the essay have been sufficiently addressed</td>
</tr>
<tr>
<td>In this essay in Q4</td>
<td>Only information relevant to the explanations in terms of Lamarckism, Darwinism and artificial selection are provided</td>
<td>Explanations in terms of Lamarckism, Darwinism and artificial selection are provided in a logical and sequential manner.</td>
<td>At least 3 correct points for the explanation using Lamarckism, 6 correct points for the explanation using Darwinism and 2 correct points using artificial selection</td>
</tr>
</tbody>
</table>

Mark | 1 | 1 | 1

TOTAL SECTION C: 20  
GRAND TOTAL: 150