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 are given instead of descriptions**
   Candidates will lose marks.

8. **If sequence is muddled and links do not make sense**
   Where 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 C✓✓
1.1.3 C✓✓
1.1.4 C✓✓
1.1.5 C✓✓
1.1.6 No correct answer
1.1.7 B✓✓
1.1.8 D✓✓
1.1.9 A✓✓

\(8 \times 2\) \(16\)

1.2  
1.2.1 Ribosome✓
1.2.2 Peptide✓
1.2.3 Replication✓
1.2.4 Non-disjunction✓
1.2.5 Extinction✓
1.2.6 Hypothesis✓
1.2.7 tRNA✓/transfer RNA

\(7 \times 1\) \(7\)

1.3  
1.3.1 B only✓✓
1.3.2 B only✓✓
1.3.3 A only✓✓

\(3 \times 2\) \(6\)

1.4  
1.4.1 (a) Adenine✓/A

(b) Deoxyribose✓ sugar

(c) Hydrogen bond✓

1.4.2 10✓

1.4.3 - DNA has the nitrogen base thymine✓
whereas RNA has the nitrogen base uracil✓

(Mark first ONE only)

\(2\) \(6\)

1.5  
1.5.1 (a) Homologous chromosomes✓/Bivalent

(b) Centromere✓

(c) Chromatid✓

1.5.2 - It holds the (two) chromatids together✓
- Attaches the chromosome to the spindle fibres✓

Any \(1\)

1.5.3 (a) Crossing over✓

(b) Prophase 1✓

1.5.4 Introduces variation✓/different gametes

\(1\) \(7\)
1.6  1.6.1  (a) *Hyracotherium*  
(b) *Sinohippus*  

1.6.2  44 ± mya (44 – 44.5)  
1.6.3  55 ± 50 /46 million years/my

TOTAL SECTION A:  48
**QUESTION 2**

2.1 2.1.1 (a) GgTt ✓
(b) Yellow ✓ leaves no thorns ✓

2.1.2 GGtt ✓
Ggtt ✓
ggTT ✓
ggTt ✓
*(Mark first FOUR only)*

2.2 2.2.1 Human somatic cells have 23 pairs ✓/46 chromosomes and this cell has only 2 pairs ✓/4 chromosomes

2.2.2 (a) 2 ✓
(b) 2 ✓

2.2.3

![Diagram of a cell with labels: Centromere, Chromosome, Nucleoplasm, Nuclear membrane, Cell membrane, Cytoplasm, R ✓, T ✓, Gamete.]

**Criteria to mark diagram**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single cell is drawn</td>
<td>1</td>
</tr>
<tr>
<td>Only 2 unreplicated chromosomes in drawing</td>
<td>1</td>
</tr>
<tr>
<td>Short unreplicated chromosome indicating T</td>
<td>1</td>
</tr>
<tr>
<td>Long unreplicated chromosome indicating R</td>
<td>1</td>
</tr>
<tr>
<td>Any ONE correct label</td>
<td>1</td>
</tr>
</tbody>
</table>

2.3 - The pair of alleles ✓ on homologous chromosomes separate
- during meiosis ✓/anaphase/ gamete formation, so that
- only one allele of each pair is present in the gamete ✓/ offspring can acquire one allele from each parent
2.4 2.4.1 (a) Suffers from Huntington's\(^c\)chorea

(b) \(\text{hh}\)

2.4.2 \(\text{hh}\)

2.4.3 - Emma's genotype is \(\text{Hh}\)/heterozygous
- The father's genotype has to be \(\text{hh}\)/homozygous recessive
- a cross between only these two genotypes\((\text{Hh and hh})\) will ensure that there is 50% chance of the child not inheriting the disease
- The child inherits one recessive allele from each parent\(\text{Hh and hh}\)

2.5.1 Transcription\(\text{GTC}\)

2.5.2 Nucleus\(\text{UAC}/\text{nucleoplasm}\)

2.5.3 (a) GTC\(\text{Valine}\)

(b) UAC\(\text{Valine}\)

2.5.4 Valine\(\text{Valine}\)

2.5.5 - A mutation affects the nucleotide sequence\(\text{sequence/gene structure}\)
- Resulting in a changed mRNA\(\text{codon}\)
- A different amino acid\(\text{may be coded for}\)
- by tRNA\(\text{anticodon}\)

Any 3
2.6 2.6.1

**P₁**  
Phenotype: Pink  
Genotype: RW  

**Meiosis**  
G/gametes: R, W  

**Fertilisation**  

**F₁**  
Genotype: RR; RW; RW; WW  
Phenotype: Red: Pink: White  

P₁ and F₁  
Meiosis and fertilisation  

---

**OR**

**P₁**  
Phenotype: Pink  
Genotype: RW  

**Meiosis**  
Gametes: R, W  

**Fertilisation**  

**F₁**  
Phenotype: Red: Pink: White  

P₁ and  
F₁  
Meiosis and fertilisation  

1 mark for correct gametes  
1 mark for correct genotypes  

Any 6  

---
QUESTION 3

3.1 3.1.1 With the discovery that the soil bacterium Agrobacterium could be used to transfer useful genes from unrelated species into plants✓

- Modified crops may become super-weeds✓/accidentally breed with other plants to become super-weeds
- They are difficult/expensive to kill✓
- and could outcompete the original crop✓/other crops Any (2)

3.1.2 - Toxic proteins might be produced✓
- Antibiotic-resistance genes may be transferred to human gut bacteria✓

(Mark fist TWO only) (2) (5)

3.1.3 - Modified crops may become super-weeds✓/accidentally breed with other plants to become super-weeds
- They are difficult/expensive to kill✓
- and could outcompete the original crop✓/other crops Any (2)

3.1.4 - Toxic proteins might be produced✓
- Antibiotic-resistance genes may be transferred to human gut bacteria✓

(Mark fist TWO only) (2) (5)

3.1.5 - Modified crops may become super-weeds✓/accidentally breed with other plants to become super-weeds
- They are difficult/expensive to kill✓
- and could outcompete the original crop✓/other crops Any (2)

3.2 3.2.1 (a) colour of lizard✓
(b) survival rate of the lizards✓

(1) (1)

3.2.2 - It decreases survival✓/lizards may die/is harmful/is lethal to the red lizards as
- they will be seen✓ on the black rock by the predators

OR
- They could not escape predators✓/catch prey on cold days
- as red lizards did not warm up fast on cold days✓ Any 1 x 2 (2)

3.2.3 - To allow enough time for reproduction✓ and survival to be able to calculate the percentage to ensure reliability✓ of results

OR
- A change in population proportions will not be seen over a shorter time period✓ to ensure reliability✓ of results Any 1 x 2 (2)

3.2.4 - Conduct the investigation in the same habitat✓/environment
- Use the same sampling technique✓
- Capture the same number of lizards in each sampled generation✓
- Take each sample at the same time of day✓/weather conditions (Mark first TWO only) Any 2 (2)

3.2.5 - There is variation✓ in colour amongst the lizards
- *Red and brown✓ lizards
- *are not camouflaged✓/cannot warm up fast enough to have energy to run away
- are killed by predators✓
- *The black lizards✓
- *are better camouflaged✓/warm up faster to have energy to avoid predators
- and survive✓/reproduce
- The allele for black colour is passed on to the next generation✓
- to produce more black lizards✓ in the next generation

Any 2+*4 compulsory marks (6)
3.2.6

**Guideline for the assessing the graph**

<table>
<thead>
<tr>
<th>Bar graph for the required data</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title of graph</td>
<td>1</td>
</tr>
<tr>
<td>Correct label and scale for X-axis</td>
<td>1</td>
</tr>
<tr>
<td>Correct label and scale for Y-axis</td>
<td>1</td>
</tr>
</tbody>
</table>
| Drawing of bars                  | 1: 1 to 3 bars plotted correctly  
                           2: All 4 bars plotted correctly |

**NOTE:**
If the wrong type of graph is drawn, marks will be lost for:

- 'Bar graph'
- 'Drawing of bars'

If two graphs are drawn mark the first ONE only

(6)

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**Comparison of the percentage of the brown and black lizards in the initial and 30th generation**

- **Initial population**
  - Brown: 80%
  - Black: 10%

- **30th generation**
  - Brown: 40%
  - Black: 60%

**Comparison of the percentage of the brown and black lizards in the initial and 30th generation.**

- **Initial population**
  - Brown: 80%
  - Black: 10%

- **30th generation**
  - Brown: 40%
  - Black: 60%
### 3.3
- The common ancestor/original camel population was separated into different populations.
- *by the sea/due to continental drift*
- There was no gene flow between the populations.
- Each population was exposed to different environmental conditions/selection pressures.
- Natural selection occurred independently in each population.
- The individuals of each population became different from each other over time.
- Genotypically and phenotypically.
- Even if the three populations were to mix again they would not be able to interbreed.

Any 5+1 compulsory (6)

### 3.4
#### 3.4.1
- $I^A$, $I^B$, $i$

#### 3.4.2
- 2

#### 3.4.3
- Any individual inherits one allele from each parent.

#### 3.4.4
- Each child has an equal/25% chance of having any blood group A, B, AB, or O.

(3) (9) [40]
SECTION C

QUESTION 4

HYPOTHESIS
- All modern humans*\textit{Homo sapiens} originated in Africa* and migrated to other parts\textsuperscript{✓} of the world \hspace{2cm} 2(*)compatible)] +1 (3)

FOSSIL EVIDENCE\textsuperscript{✓}
- Fossils of \textit{Ardipithecus} were found \textbf{ONLY} in Africa\textsuperscript{✓}/Rift Valley/Ethiopia/South Africa
- Fossils of \textit{Australopithecus} were found \textbf{ONLY} in Africa\textsuperscript{✓}/Rift Valley/Ethiopia/South Africa
- The fossils of \textit{Homo habilis} were \textbf{ONLY} found in Africa\textsuperscript{✓}
- The \textbf{OLDEST} fossils of \textit{Homo erectus} were found in Africa\textsuperscript{✓}
- The \textbf{OLDEST} fossils of \textit{Homo sapiens} were found in Africa\textsuperscript{✓} Max (4)

GENETIC EVIDENCE\textsuperscript{✓}
- Mitochondrial DNA\textsuperscript{✓}
- Is inherited only from the maternal line\textsuperscript{✓}
- Analysis of mutations\textsuperscript{✓} on this mitochondrial DNA
- shows that the oldest female ancestor were located in Africa\textsuperscript{✓}
- and that all humans descended from her\textsuperscript{✓}/mitochondrial Eve
- The Y chromosome shows the paternal line\textsuperscript{✓} Max (4)

CULTURAL EVIDENCE\textsuperscript{✓}
- The \textbf{OLDEST}/most primitive artefacts (tools, cutlery, art etc.)
- were found in Africa\textsuperscript{✓} (2)

TOTAL FOR EVIDENCE (8)

BIPEDALISM
The fossils of all three genera indicate that:
- The foramen magnum\textsuperscript{✓}
- is located in a more forward position\textsuperscript{✓}
- The pelvis\textsuperscript{✓}
- is wider and shorter\textsuperscript{✓}
- The spine\textsuperscript{✓}
- is S-shaped\textsuperscript{✓} (6)

Content (17)
Synthesis (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 sequence.</td>
<td>All aspects of the essay have been sufficiently addressed.</td>
</tr>
<tr>
<td>In this essay in Q4</td>
<td>Only information relevant to the 'Out of Africa' hypothesis and bipedal fossils of the three genera are described. No irrelevant information included.</td>
<td>The description of the evidence for the 'Out of Africa' hypothesis and the evidence of bipedalism is presented in a logical and sequential manner.</td>
<td>At least the following marks should be obtained: - 7/11 for the 'Out of Africa' hypothesis and the evidence of bipedalism. - 4/6 on evidence for bipedalism.</td>
</tr>
<tr>
<td>Mark</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

TOTAL SECTION C: 20
GRAND TOTAL: 150