Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE

GRADE 12

SEPTEMBER 2018

LIFE SCIENCES P2
MARKING GUIDELINE

MARKS: **150**

This marking guideline consists of 10 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 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. Marking guideline 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.

SECTION A

QUESTION 1

1.1	1.1.1	B ✓✓		
	1.1.2	D ✓✓		
	1.1.3	B ✓✓		
	1.1.4	D ✓✓		
	1.1.5	C ✓✓		
	1.1.6	C ✓✓		
	1.1.7	D ✓✓		
	1.1.8	C ✓✓		
	1.1.9	B ✓✓		
	1.1.10	A ✓✓	(10 x 2)	(20)
1.2	1.2.1	Variation ✓		
	1.2.2	Autosomes ✓		
	1.2.3	Fossils ✓		
	1.2.4	Alleles ✓		
	1.2.5	Haemophilia ✓		
	1.2.6	Biotechnology ✓		
	1.2.7	Phylogenetic tree ✓		
	1.2.8	Foramen magnum ✓		
	1.2.9	Mitochondrial DNA ✓	(9 x 1)	(9)
1.3	1.3.1	Both A and B ✓✓		
	1.3.2	A only ✓✓		
	1.3.3	B only ✓	(3 x 2)	(6)
1.4	1.4.1	550 ✓mya (Accept any value between 545 and 555)		(1)
	1.4.2	Bacteria ✓		(1)
	1.4.3	Ferns ✓		(1)
	1.4.4	Birds ✓		(1)
	1.4.5	Reptiles ✓		(1)
	1.4.6	They share a more recent common ancestor ✓		(1)

1.5 1.5.1 Cloning ✓ (1)

1.5.2 Ovum ✓ (1)

1.5.3 Uterus ✓ (1)

1.5.4 46 ✓ (1)

1.5.5
- Production of children for infertile couples ✓
- Compensating for the loss of a loved one ✓
- Cloning of organs from a person's tissue and used as a transplant ✓
- Young cells cloned to prolong life ✓/ Delayed aging

(Any 1) **(Mark first ONE only)** (1)

1.6
- Breeding at different times of the year ✓
- Species-specific courtship behaviour ✓
- Adaptation to different pollinators ✓
- Infertile offspring ✓
- Prevention of fertilisation ✓

(Mark first FOUR only (Any 4) (4)

TOTAL SECTION A: 50

QUESTION 2

2.1 2.1.1 UAC ✓ (1)

2.1.2 (a) Methionine – Arginine – Glycine ✓✓ (2)

(b) - The corresponding mRNA codon will be AUC ✓
- resulting in isoleucine being picked up by tRNA ✓
- resulting in a different protein ✓ (3)

2.2 2.2.1 (a) Black ✓fur (1)

(b) White ✓fur (1)

2.2.2 1BB :2Bb :1 bb ✓✓ (2)

2.2.3 12 ✓ (1)

2.2.4 **P_1** Phenotype Black X White ✓
Genotype Bb X Bb ✓
Meiosis
G/gametes B, b X I^B, i
Fertilisation
F_1 Genotype Bb Bb; bb bb ✓*
Phenotype Black white✓*
P_1 and F_1 ✓
Meiosis and fertilisation ✓

OR

P_1 Phenotype Black X White ✓
Genotype Bb X bb ✓

Meiosis

Fertilisation

Gametes	B	b
b	Bb	bb
b	Bb	bb

1 mark for correct gametes
1 mark for correct genotypes ✓*

F_1 Phenotype Black , white ✓*
P_1 and F_1 ✓
Meiosis and fertilisation ✓

***(**compulsory 2 + any 4) (6)

2.3.1 **X** – Centromere ✓
Y – Homologous chromosomes ✓ (2)

2.3.2 Metaphase **I** ✓ (1)

2.3.3
- Homologous chromosomes ✓/ chromosome pairs
- are randomly arranged ✓
- at the equator ✓of the cell
- attached to spindle fibres ✓ (Any 3) (3)

2.3.4
- Random arrangement of chromosomes introduces genetic variation✓ in gametes which
- may lead to organisms which are better suited ✓ to a changing environment

OR

- It results in chromosomes moving apart✓
- resulting in halving of chromosome number✓/haploid gametes

OR

- Contraction of spindle fibres ✓
- allows chromosomes to separate ✓ move to the poles (2)
-

2.4 2.4.1
- The original population of pistol shrimp ✓
- was separated ✓into different populations
- **by a narrow strip of land*** ✓**/Panama**
- 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 the two shrimp populations became different ✓
  from each other
- genotypically and phenotypically ✓
- Even if the two populations were to mix again ✓
- they would not be able to interbreed ✓ Any 6 +***1** (7)

2.4.2
- Speciation resulted in two species ✓ / new species
- thereby increasing the biodiversity ✓ of the pistol shrimp. (2)

2.5 2.5.1 I^A ✓and I^B ✓ (2)

2.5.2 Baby **Y** ✓ and **Z** ✓ (2)

2.5.3 I^Ai ✓✓ (2)
[40]

QUESTION 3

3.1 3.1.1 Pedigree ✓ diagram (1)

3.1.2 Recessive ✓ (1)

3.1.3
- Neither individual 1 and 2 have the disease ✓ but
- they have two children 7 and 8 with the disease. ✓

OR

- Individual 3 and 4 do not have the disease ✓
- but have child 12 with the disease. ✓

(2)

3.1.4 (a) Nn ✓ (1)

(b) nn ✓ (1)

3.1.5
- Individual 11 can only have genotype NN ✓
- If crossed with individual 10 with the genotype nn ✓
- there is no chance/ 0% probability of having a child with the disease ✓
- as all offspring will have the genotype Nn ✓ (Any 3)

(3)

3.2 3.2.1 (a) Fruit colour ✓ and Bird species ✓ (2)

(b) Preference of fruit colour ✓ (1)

3.2.2
- Same number of birds captured ✓
- Petri dish was identical✓
- Same number of fruits in each petri dish ✓ / 2 red and 2 orange fruits
- Cages of equal size ✓
- Only the first choice was recorded ✓ (Any 2)

(Mark first TWO only)

(2)

3.2.3
- The sample size of the bird species was increased ✓ when 10 birds were used instead of one.
- improving the reliability✓ of the investigation

(2)

3.2.4 $\frac{30}{40}$ ✓x 100✓ = 75✓% (3)

3.2.5
- There is variation in fruit colour ✓ in the salmonberry plants
- Some are red and some are orange ✓
- Birds prefer the red fruits and disperse their seeds ✓/ red fruit are selected and their seeds are dispersed by birds ✓
- Orange fruits are not preferred, and their seeds are not dispersed ✓/ orange fruits are not selected and their seeds are not dispersed by birds
- The number of orange fruit will decrease ✓
- due to there being no germination of their seeds ✓
- The seeds of red fruits germinate ✓
- more red fruits are produced ✓
- the allele for producing red fruits is passed on to offspring ✓leading to an increase in the proportion of salmonberry plants that produce red fruits over many generations (Any 6) (6)

3.3 3.3.1 (a) (*Homo*) *erectus* ✓ (1)

(b) (*Homo*) *habilis* ✓ (1)

3.3.2 4 ✓ million years ago (1)

3.3.3 Fossil ✓ evidence
(Mark first ONE only) (1)

3.3.4 (a) Raymond Dart ✓ (1)

(b) Taung village ✓ / Sterkfontein (1)

3.3.5
- *Australopithecus* has well developed brow ridges ✓ whereas in
- *Homo sapiens sapiens* brow ridges are not well developed. ✓
- The jaw is more prognathous ✓ (protruding) in *Australopithecus* and
- less prognathous ✓ (protruding) in *Homo sapiens sapiens* (4)

3.3.6 Cranial capacity increased ✓ (1)

3.4 According to punctuated equilibrium:
- Evolution involves long periods of time ✓
- where species do not change ✓ /change very little
- This alternates with short periods of time ✓
- where rapid changes occur ✓ through natural selection (4)

[40]

TOTAL SECTION B: 80

SECTION C

QUESTION 4

DNA Replication

- is the process by which DNA makes an identical copy of itself ✓
- It occurs during interphase ✓
- just before cell division ✓ (mitosis and meiosis)
- It must occur so that DNA is shared amongst daughter cells during cell division ✓
- so that each daughter cell has the same number of chromosomes as the original cell ✓

It takes place as follows:

- Double helix DNA unwinds ✓
- and unzips ✓ / separates when
- the weak hydrogen bonds break ✓
- and this is controlled by enzymes ✓
- Each original DNA strand is used as a template ✓to form a new strand
- by attaching to free nucleotides ✓ from the nucleoplasm
- to form complementary strands ✓ (A to T, C to G)
- Each DNA molecule now consists one original strand and one new strand ✓
- The result is two genetically identical DNA molecules ✓
- The entire process is controlled by enzymes ✓ (Max. 13) (13)

Uses of DNA profiling

DNA profiles are used for:

- Testing for the presence of specific alleles ✓/genes that cause a genetic disorder
- Investigating crimes ✓
- Establishing paternity ✓/ whether a person is the father of a child or not
- Identifying family relationships ✓ e.g. siblings or cousins
- Identifying organisms from their remains ✓
- Establishing matching tissues for organ transplants ✓ (Max. 4) (4)

Content: (17)
Synthesis: (3)
[20]

ASSESSING THE PRESENTATION OF THE ESSAY

Criterion	Relevance (R)	Logical sequence (L)	Comprehensive (C)
Generally	All information provided is relevant to the question.	Ideas are arranged in a logical sequence.	All aspects of the essay have been sufficiently addressed.
In this essay in Q4	Only information relevant to the description of DNA replication and the uses of DNA profiling. No irrelevant information included.	The description of DNA replication and uses of DNA profiling is presented in a logical and sequential manner.	At least **the following marks should be obtained:** - **8/13** for the description of DNA replication and - **3/4** for the uses of DNA profiling.

TOTAL SECTION C: 20
GRAND TOTAL: 150