Education

KwaZulu-Natal Department of Education
REPUBLIC OF SOUTH AFRICA

LIFE SCIENCES P2

PREPARATORY EXAMINATION

SEPTEMBER 2017

MARKING GUIDELINE

NATIONAL SENIOR CERTIFICATE

GRADE 12

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. 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.

SECTION A

QUESTION 1

1.1	1.1.1	A✓✓		
	1.1.2	D✓✓		
	1.1.3	C✓✓		
	1.1.4	A✓✓		
	1.1.5	D✓✓		
	1.1.6	B✓✓		
	1.1.7	C✓✓		
	1.1.8	A✓✓		
	1.1.9	B✓✓	(9 x 2)	**(18)**
1.2	1.2.1	Double helix✓		
	1.2.2	(DNA) profile✓/profiling		
	1.2.3	Theory✓		
	1.2.4	Population✓		
	1.2.5	Phylogenetic tree✓/cladogram		
	1.2.6	Genetically modified✓/genetically engineered/transgenic		
	1.2.7	Stem✓ cell		
	1.2.8	Biogeography✓	(8 x 1)	**(8)**
1.3	1.3.1	B only✓✓		
	1.3.2	None✓✓		
	1.3.3	A only✓✓	(3 x 2)	**(6)**
1.4	1.4.1	Incomplete✓ dominance		(1)
	1.4.2	(a) YY✓		(1)
		(b) YR✓		(1)
	1.4.3	(a) 4✓		(1)
		(b) 1✓/2		(1)
				(5)
1.5	1.5.1	(a) Homologous chromosomes✓/ bivalent		(1)
		(b) Centriole✓		(1)
		(c) Spindle fibre✓		(1)
	1.5.2	Anaphase I✓		(1)
	1.5.3	Non-disjunction✓		(1)
	1.5.4	Two✓/2		(1)
	1.5.5	Crossing over✓ Random arrangement of chromosomes at the equator✓/Independent assortment of chromosomes		(2)
		Mark first TWO only		**(8)**
1.6	1.6.1	Out of Africa✓ hypothesis		(1)
	1.6.2	(*Homo) erectus*✓/*H. erectus*		(1)
	1.6.3	(*Homo*) *habilis*✓/ *H. habilis*		(1)
	1.6.4	- Genetic evidence✓/Mitochondrial DNA - Fossil evidence✓		(2)
		Mark first TWO only		**(5)**
			TOTAL SECTION A:	**50**

QUESTION 2

2.1 2.1.1
- The parents have the dominant phenotype✓/have one dominant allele
- To have children with the recessive characteristic✓/bb
- The other allele of each parent must be recessive✓ (3)

2.1.2

P_1	Phenotype	Bent little fingers	x	Straight little fingers✓
	Genotype	Bb	x	bb✓
Meiosis				
	G/gametes	B, b	x	b, b ✓
Fertilisation				
F_1	Genotype	Bb; Bb;		bb; bb ✓
	Phenotype	bent little finger		straight little fingers✓

P_1 and F_1✓
Meiosis and fertilisation✓

OR

P_1	Phenotype	Bent little fingers	x	Straight little fingers ✓
	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	bent little fingers; straight little fingers✓

P_1 and F_1✓
Meiosis and fertilisation✓ Any (6)
(9)

2.2
- The mRNA strand✓
- attaches to a ribosome✓
- Each tRNA molecule carrying a specific amino acid✓
- according to its anticodon✓
- matches up with the complementary codon✓ of the mRNA
- so that the amino acids are placed in the correct sequence✓
- Adjacent amino acids join together by peptide bonds✓
- to form a protein✓ Any **(6)**

2.3 2.3.1 (a) NNGG✓ (1)

(b) Nngg✓ (1)

(c) Ng; ng✓ (1)

2.3.2 nngg✓✓ (2)
(5)

2.4
- There is variation in the snail population✓/some are dark in colour and some are white
- The dark snails are camouflaged✓ / blend in with the garden at night
- The white snails are not camouflaged✓ / do not blend in with the garden at night
- Predators eat the white snails✓/the white snails die
- The dark snails survive✓
- and will reproduce✓/ pass this characteristic on to their offspring
- increasing the proportion of dark brown snails in subsequent generations✓

Any **(5)**

2.5 2.5.1 Emu✓ (1)

2.5.2
- They share a more recent✓
- common ancestor✓ (2)

2.5.3 Accept any answer in the following range: 82 - 84✓ mya✓ (2)

2.5.4
- Millions of years ago a population of ancestors that could fly was separated✓
- by the sea✓
- and there was no gene flow✓ between the different groups
- Each group was exposed to different environmental conditions✓
- and natural selection occurred independently✓ in each population
- The populations of birds on each continent became different✓ from each other
- both genotypically and phenotypically✓
- Even if the two populations were to mix again✓
- Eventually they could not interbreed to produce fertile offspring✓

Any (6)

2.5.5
- The flightless birds did not use their wings to fly✓
- and their wings became smaller✓/weaker
- and they therefore lost the ability to fly✓
- They then passed the characteristic of small/weak wings to their offspring✓
- which therefore were unable to fly✓

Any (4)
(15)
[40]

QUESTION 3

3.1 3.1.1 (a) Presence or absence of artificial selection✓ (1)

(b) The number of plants with more than 25 hairs on the leaves✓ (1)

3.1.2 The students:
- Used the same species of *Brassica*✓
- Used the same number of plants ✓
- Used one mature leaf from each plant✓
- Counted the hairs on the same part of the leaf✓ Any (2)

Mark first TWO only

3.1.3 Artificial selection can be used to increase the number of plants with 25 or more hairs on the leaves✓✓ (2)

3.1.4
- There is a range✓
- of intermediate phenotypes✓

OR

- The variation in the number of hairs✓
- occurs on a continuous scale✓/ continuum (2)

(8)

3.2 3.2.1 Interphase✓ (1)

3.2.2
- The DNA molecule unwinds✓
- and the hydrogen bonds break✓
- so that the two strands separate✓/unzip
- Free DNA nucleotides from the nucleoplasm✓
- join with complementary bases✓
- on the original strands which act as templates✓
- resulting in two identical DNA molecules✓ Any (6)

3.2.3
- It ensures that each daughter cell gets an identical copy of the DNA after mitosis✓
- It ensures that each daughter cell gets the correct number of chromosomes after mitosis✓ (2)

Mark first TWO only

3.2.4 (a) - Guanine/G has attached to another guanine✓on strand 3
- instead of bonding with cytosine/C✓ (2)

(b) - The code on the DNA has changed✓
- therefore the codons on the mRNA will be different✓
- and will code for a different amino acid✓
- The sequence of amino acids in the protein will be different✓
- resulting in the formation of a different protein✓ Any (4)

(15)

3.3	3.3.1	1 500 – 900✓ml = 600✓ml		(2)
	3.3.2	*Australopithecus africanus*✓		(1)
	3.3.3	- Improved intelligence✓ - enables higher thinking✓/ problem solving/ creativity for making tools		(2)
	3.3.4	- Scientist have found fossil skulls✓ - and are able to measure the cranial capacity✓/volume of the cranium		(2)
	3.3.5	(a) The pelvis became wider✓ and shorter✓		(2)
		(b) The foramen magnum moved✓ to a forward position✓		(2)
	3.3.6	- Freely rotating arms✓ - Longer upper arms than forearms✓ - Rotation around the elbow joint✓ - Bare fingertips✓ - Nails instead of claws✓ - Opposable thumb✓ **Mark first THREE only**	Any	(3)
	3.3.7	- If the sequence of genes✓/mutations on the DNA - is very similar in different species✓ - then these species are closely related✓/shared a common ancestor		(3) **(17)** **[40]**

SECTION C

QUESTION 4

Inheritance of blood groups

- Blood groups in humans is controlled by one gene✓
- with three alleles✓/ I^A, I^B, i
- Each person inherits any 2 of the three alleles✓ from their parents
- I^A and I^B alleles are co-dominant✓
- I^A and I^B are dominant over the i allele✓/ the i allele is recessive to I^A and I^B

- Inheriting the I^A allele from both parents✓/ having the genotype I^AI^A
- or inheriting the I^A allele from one parent and i from the other parent✓/ having the genotype I^Ai
- results in blood group A✓

- Inheriting the I^B allele from both parents✓/ having the genotype I^BI^B
- or inheriting the I^B allele from one parent and i from the other parent✓/ having the genotype I^Bi
- results in blood group B✓

- Inheriting I^A from one parent and inheriting I^B from the other parent✓/having the genotype I^AI^B
- results in the AB blood group✓

- Inheriting the i allele from both parents✓/having the genotype ii
- results in blood group O ✓ Max 12

Use of blood groups in paternity testing

- If a genetic diagram shows that the mother and the man could produce a child with a particular blood group✓
- then he may be the father✓
- but we cannot say for sure that he is the father✓
- because there are many males with the same blood type✓

- If a genetic diagram shows that the mother and the man could not produce a child with a particular blood group✓
- then he is definitely not the father✓ Max 5

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 provided information relevant to: - The inheritance of blood groups - The use of blood groups in paternity testing No irrelevant information included.	Information on: - The inheritance of blood groups - The use of blood groups in paternity testing is presented in a logical and sequential manner.	At least the following marks should be obtained: - The inheritance of blood groups **8/12** - The use of blood groups in paternity testing **3/5**
Mark	1	1	1

TOTAL SECTION C: 20
GRAND TOTAL: 150