basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS/
NATIONAL SENIOR CERTIFICATE EXAMINATIONS

LIFE SCIENCES P2

2023

MARKING GUIDELINES

MARKS: 150

These marking guidelines consist of 11 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 learner's 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. The provincial internal moderator must be consulted, 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	B✓✓		
	1.1.2	C✓✓		
	1.1.3	C✓✓		
	1.1.4	A✓✓		
	1.1.5	D✓✓		
	1.1.6	C✓✓		
	1.1.7	B✓✓		
	1.1.8	D✓✓		
	1.1.9	B✓✓	(9 x 2)	**(18)**
1.2	1.2.1	Incomplete dominance✓		
	1.2.2	Chiasma✓/chiasmata		
	1.2.3	Transcription✓		
	1.2.4	Deoxyribose✓		
	1.2.5	Hydrogen✓ (bond)		
	1.2.6	Genetic engineering✓		
	1.2.7	Karyotype✓	(7 x 1)	**(7)**
1.3	1.3.1	Both A and B✓✓		
	1.3.2	None✓✓		
	1.3.3	B only✓✓	(3 x 2)	**(6)**
1.4	1.4.1	(a) Prophase I✓		(1)
		(b) Twelve✓/12		(1)
		(c) Three✓/3		(1)
	1.4.2	(a) Nuclear membrane✓		(1)
		(b) Cell membrane✓/plasmalemma/plasma membrane		(1)
		(c) Nucleoplasm✓		(1)
	1.4.3	- Testes✓		(1)
		- Ovaries✓		(1)
		(Mark first TWO only)		
				(8)

	1.5.1	Dihybrid✓ cross		(1)
	1.5.2	(a)	Smooth✓ stem	(1)
		(b)	Elongated✓ fruit	(1)
	1.5.3	(a)	nnrr✓✓/nrnr/ rrnn	(2)
		(b)	Smooth stem round fruit✓✓	(2) **(7)**
1.6	1.6.1	Karabo✓		(1)
	1.6.2	*Australopithecus africanus*✓		(1)
	1.6.3	(a)	(Lee) Berger✓	(1)
		(b)	(Raymond) Dart✓	(1) **(4)**

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 2.1.1 (a) Amino acid✓ (1)

(b) mRNA✓ (1)

2.1.2 (a) TAC✓✓ (2)

(b) GUA✓ (1)

2.1.3 Translation✓*
- Each tRNA carries a specific amino acid✓
- When the anticodon on the tRNA✓/GUA
- matches the codon on the mRNA✓/CAU
- then tRNA brings the required amino acid to the ribosome✓
- Amino acids become attached to each other by peptide bonds✓
- to form the required protein✓ **1* compulsory +** 6 (7)

(12)

2.2
- Codon GAC✓ (on the mRNA)
- changed to GAU✓
- Both these codons code for the same amino acid✓/Aspartic acid
- therefore there will be no effect✓ on the protein formed **(4)**

2.3

DNA	RNA
Has deoxyribose✓ sugar	Has ribose✓ sugar
Has thymine✓/nitrogenous base T	Has uracil✓/nitrogenous base U

(Mark first TWO only) Table 1 + (2 x 2) **(5)**

2.4 2.4.1 (a) Chromosomal✓mutation (1)

(b) Non-disjunction✓ (1)

(c) Mitosis✓ (1)

2.4.2
- The chromosome pair/chromatids failed to separate✓
- at position 21✓
- during anaphase✓(I or II)
- resulting in one daughter cell having an extra chromosome✓/ 24 chromosomes
- Fusion of a gamete with 24 chromosomes✓
- and a normal gamete✓/gamete with 23 chromosomes
- results in a zygote with 47 chromosomes✓/extra chromosome at position 21 Any (5)

2.4.3
- In Trisomy 21 there is an extra chromosome/three copies of chromosome 21 in each somatic cell✓
  In Mosaic Down syndrome there is an extra chromosome only in some cells✓
- Trisomy 21 occurs during meiosis✓/before fertilisation
  Mosaic Down syndrome occurs during mitosis✓/after fertilisation (2 x 2) (4)

(Mark first TWO only)

(12)

2.5 2.5.1
- The disorder is controlled by alleles✓/genes that
- are located on the autosomes✓ (2)

2.5.2
- One✓/1 (1)

2.5.3
- Individuals 3 and 4 are both without Tay-Sachs disease✓
- The child has Tay-Sachs✓/Individual 7 has Tay-Sachs
- which is only expressed in the phenotype in a homozygous condition✓
- Each parent must carry a recessive allele✓/be heterozygous
- The child has two recessive alleles✓
- One was received from each parent✓

OR

- Individuals 3 and 4 are both without Tay-Sachs disease✓
- If it was caused by a dominant allele✓
- then individual 3 or 4 would *have* Tay Sachs✓
- and still have a child with Tay-Sachs✓/individual 7 has Tay-Sachs
- who could be heterozygous✓ Any (5)

2.5.4
TT✓
tt✓ (2)

(10)

2.6

P_1	Phenotype	Woman without haemophilia	x	Man with haemophilia✓
	Genotype	X^HX^h	x	X^hY✓
Meiosis				
	G/gametes	X^H, X^h	x	X^h, Y✓
Fertilisation				
F_1	Genotype	X^HX^h, X^HY, X^hX^h, X^hY✓		
	Phenotype	1 daughter without haemophilia, 1 daughter with haemophilia, 1 son without haemophilia, 1 son with haemophilia✓		

0%✓*chance of a daughter homozygous for normal blood clotting

P_1 and F_1✓
Meiosis and fertilisation✓

***1 compulsory mark** + any 6

OR

P_1	Phenotype	Woman without haemophilia	x	Man with haemophilia✓
	Genotype	X^HX^h	x	X^hY✓

Meiosis

Fertilisation

Gametes	X^H	X^h
X^h	X^HX^h	X^hX^h
Y	X^HY	X^hY

1 mark for correct gametes
1 mark for correct genotypes

F_1 Phenotype: 1 daughter without haemophilia, 1 daughter with haemophilia, 1 son without haemophilia, 1 son with haemophilia✓

0%✓* chance of a daughter homozygous for normal blood clotting

P_1 and F_1✓
Meiosis and fertilisation✓

***1 compulsory mark**+ any 6 **(7)**

[50]

QUESTION 3

3.1 3.1.1 To determine which blood group was the most common in their community✓✓ (2)

3.1.2 (a)
- Obtain permission from the school✓/clinic to conduct the investigation
- Decide on the sample size✓
- Decide on the method for recording results✓
- Decide on time✓/date to collect data from the clinic (3)

(Mark first THREE only)

(b)
- Sampled 3✓/all blood donor clinics in the community
- 200 donors per clinic sampled✓/600 donors Any (1)

(Mark first ONE only)

(c) First time donors' blood groups are not known yet✓/ not in the database (1)

3.1.3 $\left.\frac{15}{100}\right\}$✓x 600✓= 90✓ participants (3)

3.1.4 (a) (Blood group) O✓ (1)

(b) (Blood group) AB✓ (1)

3.1.5 $I^A I^A$ ✓
$I^A i$✓ (2)

(14)

3.2 3.2.1 Artificial selection✓/selective breeding (1)

3.2.2
- They chose dogs with desirable traits✓
- and interbred✓ them to
- produce offspring with these traits✓ (3)

3.2.3
- Allow them to interbreed with each other✓
- and see whether they produce fertile offspring✓

OR

- Analysis of DNA✓
- to check for matching sequences✓ (2)

3.2.4
- Rhodesian ridgeback✓
- is strong, athletic and fast✓
- is able to catch the prey✓ Any (2)

3.2.5 - Due to reduction in gene pool✓/variation
- they will not be able to hunt✓/find shelter/defend themselves
- as well as wolves are able to✓
- therefore unable to survive in the wild✓ (3)

(11)

3.3
- If a population of a single species becomes separated by a geographical barrier✓ (sea, river, mountain, lake)
- then the population splits into two✓
- There is now no gene flow between the two populations✓
- Since each population may be exposed to different environmental conditions✓/the selection pressure may be different
- natural selection occurs independently in each of the two populations✓
- such that the individuals of the two populations become (very) different✓ from each other
- genotypically and phenotypically✓
- Even if the two populations were to mix again✓
- they will not be able to interbreed✓
- The two populations are now different species✓ Any **(7)**

3.4 3.4.1 Phylogenetic tree✓/cladogram (1)

3.4.2 (a) P✓ (1)

(b) R✓ (1)

3.4.3 (a) Bonobo✓
Chimpanzee✓ (2)
(Mark first TWO only)

(b) Orang-utan✓
Gorilla✓
Bonobo✓
Chimpanzee✓ Any (2)
(Mark first TWO only)

3.4.4
- Foramen magnum at a more backward position✓
- C-shaped spine✓
- Pelvis long and narrow✓ (3)

(**Mark first THREE only)**

(10)

3.5 3.5.1 (Modern) humans originated in Africa✓ and migrated to other parts of the world✓ (2)

3.5.2
- Fossils of *Ardipithecus* were found in Africa only✓
- Fossils of *Australopithecus* were found in Africa only✓
- Fossils of *Homo habilis* were found in Africa only✓
- The oldest fossils of *Homo erectus* were found in Africa✓while the younger fossils of *Homo erectus* were found in other parts of the world✓
- The oldest fossils of *Homo sapiens* were found in Africa✓while
- the younger fossils of *Homo sapiens* were found in other parts of the world✓ Any (6)

(8)
[50]

TOTAL SECTION B: 100
GRAND TOTAL: 150