



education

Department of
Education
FREE STATE PROVINCE

PREPARATORY EXAMINATION

GRADE 12

LIFE SCIENCES P2

SEPTEMBER 2021

MARKS: 150

MARKING GUIDELINES

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 are 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 the 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 the 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 the answer fits into the correct sequence of questions, but the wrong number is given, it is acceptable.
11. **If the 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 differently.**
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 applies to all official languages.
19. **Changes to the memorandum**
No changes must be made to the memoranda. The provincial internal moderator must be consulted.

SECTION A

QUESTION 1

1.1	1.1.1	A ✓✓		
	1.1.2	C ✓✓		
	1.1.3	C ✓✓		
	1.1.4	B ✓✓		
	1.1.5	C ✓✓		
	1.1.6	B ✓✓		
	1.1.7	B ✓✓		
	1.1.8	C ✓✓		
	1.1.9	A ✓✓		
	1.1.10	B ✓✓	(10 x 2)	(20)
1.2	1.2.1	Mitosis ✓		
	1.2.2	Biological ✓ evolution		
	1.2.3	Colour-blindness ✓		
	1.2.4	Homologous ✓ structures		
	1.2.5	Lamarckism ✓		
	1.2.6	Mitochondria ✓		
	1.2.7	Monohybrid ✓		
	1.2.8	Foramen magnum ✓		
	1.2.9	Chromatids ✓		
	1.2.10	Hypothesis ✓	(10 x 1)	(10)
1.3	1.3.1	B only ✓✓		
	1.3.2	A only ✓✓		
	1.3.3	Both A and B ✓✓	(3 x 2)	(6)
1.4	1.4.1	Karyotype is the pairing and ordering of chromosomes according ✓ to their size, form and number. ✓		(2)
	1.4.2	45 ✓		(1)
	1.4.3	(a) Gonosomes ✓/Sex chromosomes		(1)
		(b) Down syndrome ✓		(1)
		(c) Non-disjunction ✓		(1)
				(6)
1.5.	1.5.1	2 ✓/two/feather colours and comb shape		(1)
	1.5.2	(a) WWFf ✓✓		(2)
		(b) Black feathers ✓ and unforked combs ✓		(2)
		(c) WwFF ✓, WwFf ✓ en Wwff ✓		(3)
				(8)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 2.1.1 (a) nuclear membrane pore✓/pore (1)
(b) tRNA✓ (1)

2.1.2 (a) DNA✓ (1)
(b) mRNA✓ (1)

2.1.3

A- DNA	B- m RNA
1. Deoxyribose as a sugar✓	1. Ribose as a sugar✓
2. Thymine as a nitrogen base✓	2. Uracil as nitrogen base✓
	Table: ✓

(5)

2.1.4 One string of a DNA ✓-molecule act as a template on which a complimentary mRNA is formed. ✓ (2)
(11)

2.2 2.2.1 5/five ✓ (1)

2.4.2 TAC ✓✓ (2)

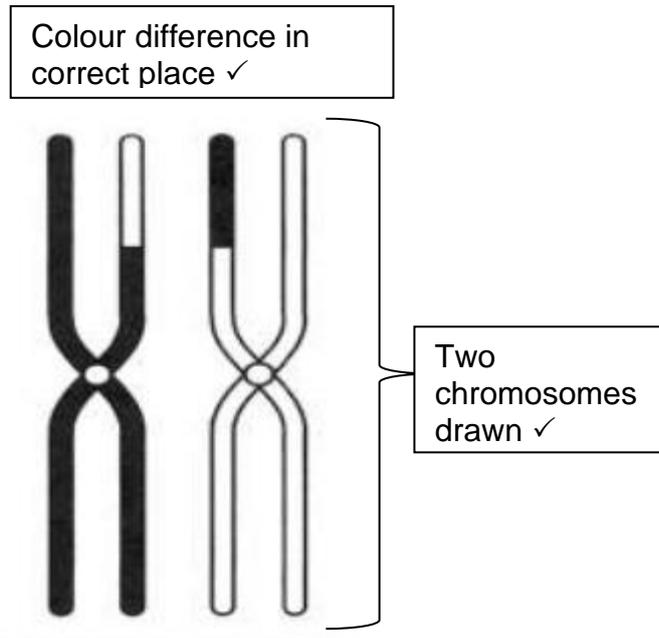
2.4.3 Guanine ✓ (1)
(4)

2.3 - The DNA-double helix unwinds ✓and
- unzip ✓/hydrogen bonds between the two strands break
- to form two separate strands. ✓
- Both DNA strands serves as templates ✓
- to build a complementary DNA ✓/(A to T and C to G)
- using free DNA nucleotides ✓ from the nucleoplasm.
- This results in two identical DNA molecules ✓
- Each molecule consists of one original strand and one new strand ✓ (Any 6) **(6)**

2.4 2.4.1 (a) Chromatids ✓ (1)
(b) Centromere ✓ (1)
(c) Homologous chromosomes ✓ (1)

2.4.2 **Crossing over** ✓ *
- occurs during prophase I ✓
- Homologous chromosomes ✓
- non-sister – chromatids overlap ✓
- at points called chiasma ✓/chiasmata
- Genetic material is exchanged ✓
- resulting in new combinations of genetic material ✓ from both parents **(1* compulsory mark + Any 5)** (6)

2.4.3 Heading: Homologous chromosome after cross over ✓



(3)
(12)

2.5 2.5.1 Omega-6 ✓
(Mark first ONE only) (Any 1) (1)

2.5.2 $\frac{10}{1800}$ } ✓ X 100 ✓ = 0,55% ✓ (3)

2.5.3 - Healthier for humans to eat/combating heart disease ✓
- Mass production of healthy fat ✓
- Improve intelligence ✓
(Mark first TWO only) (Any 2) (2)

2.5.4 - The gene responsible for producing omega-3 fatty acids is located in the DNA of a Salmon/Mackerel/Tuna ✓
- The gene is cut from the donor DNA and inserted in the plasmid of bacterium ✓
- Bacterium replicates to form many copies of the gene ✓
- These genes are then inserted into the cells of the zygote/embryo ✓
(4)
(10)

2.6 2.6.1 They cannot produce fertile offspring ✓ (1)

- 2.6.2
- If the original population of snapping shrimps/genus Alpheus splits into two populations ✓ by a geographical barrier a land bridge ✓*/ **Isthmus of Panama**
 - there is now no gene flow between the two populations of shrimps ✓
 - Since each population may be exposed to different environmental conditions ✓
 - 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 reproduce with each other ✓ thus becoming different/new species

(✓ ***Compulsory mark + any 5**) (6)

(7)

[50]

QUESTION 3

- 3.1 3.1.1 - Freely rotating arms ✓
- Long upper arms ✓
- Five digits per limb ✓
- Flat nails instead of claws ✓/bare, sensitive finger tips
- Opposable thumbs ✓/precision grip
(Mark first THREE only) (Any 3) (3)

- 3.1.2 The pelvis changes from long and narrow ✓ to short and wider ✓ to support the greater weight ✓ of the upper body due to upright posture (3)

- 3.1.3 - Taung child ✓
- Mrs Ples ✓
- Karabo/Australopithecus sediba ✓
- Little Foot ✓
(Mark first TWO only) (Any 2) (2)

- 3.1.4 - Mitochondrial DNA ✓ is passed down from mother to child ✓/Is inherited only from the maternal line
- Analysis of mutations ✓ on this mitochondrial DNA
- were traced to an ancestral female that existed in Africa ✓
- and shows that all humans descended from her ✓/mitochondrial Eve (Any 4) (4)
(12)

- 3.2 3.2.1 Phylogenetic tree ✓ (1)

- 3.2.2 (a) 2 ✓/Two (1)
(b) 7 ✓/Seven (1)

- 3.2.3 *A. robustus* and *A. boisei* share a more recent ✓ common ancestor. ✓

OR

A. aferensis ancestral lineage ✓ gives rise to two daughter lineages ✓ *A. robustus* and *A boisei*. (2)

- 3.2.4 *Homo habilis* ✓/*H. habilis* (1)

- 3.2.5 - The fossils of *Homo habilis* were ONLY found in Africa ✓
- The OLDEST fossils of *Homo erectus* were found in Africa ✓
- The OLDEST fossils of *Homo sapiens* were found in Africa ✓
- While younger fossils were found in other parts of the world ✓ (4)
(10)

3.3 3.3.1 Charles Darwin ✓ (1)

3.3.2 Snail with black shell ✓ (1)

3.3.3 - Gene mutation ✓
- Result of a change in the nucleotide sequence ✓ in the DNA molecule

- Chromosome mutation ✓
- Results in the number or structure of the chromosome change during meiosis ✓ (4)

3.3.4

NATURAL SELECTION	ARTIFICIAL SELECTION
The environment ✓ or nature is the selective force	Humans ✓ represent the selective force
Selection is in response to suitability to the environment ✓	Selection is in response to satisfying human needs ✓
Occurs within species ✓	May involve one or more species ✓ (as in cross-breeding)

Table ✓ (7)
(13)

3.4 3.4.1 (a) Female without Polydactyly/Unaffected female ✓ (1)

(b) Dd ✓✓ (2)

(c) 6/six ✓ (1)

3.4.2 One of the chromosome pair/ homologues chromosome 1 to 22✓/not carried on the gonosomes/sexchromosomes have a dominant allele mutation for polydactyly✓ and will therefore always be expressed in the phenotype ✓ either in a homozygous (DD)/heterozygous genotype (Dd) ✓/will hide the recessive trait in an heterozygous organism (4)

3.4.3 **P₁**

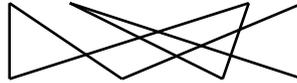
Phenotype : Polydactyly man x Female without Polydactyly ✓

Genotype : Dd x dd ✓

Meiosis

G/gametes D, d x d, d ✓

Fertilization



F₁ Genotype Dd, Dd, dd, dd } ✓

1 Dd : 1 dd }

Phenotype

2 with polydactyly/2 affected

2 without polydactyly/2 not affected

Phenotypic ratio

1 with polydactyly: 1 without polydactyly } ✓*

1 : 1

P₁ and F₁ ✓

Meiosis and fertilization ✓

(✓***Compulsory** 1 + Any 6) (7)

OR

P₁

Phenotype: Polydactyly man x Female without Polydactyly ✓

Genotype: Dd x dd ✓

Meiosis

Fertilization

		D	d
Gametes		D	d
	d	Dd	dd
	d	Dd	dd
1 mark for correct gametes ✓			
1 mark for correct genotypes ✓			

F₁

Genotype Dd, Dd, dd, dd } ✓

1 Dd : 1 dd }

Phenotype

2 with polydactyly/2 affected

2 without polydactyly/2 not affected

Phenotypic ratio

1 with polydactyly : 1 without polydactyly } ✓*

1 : 1

P₁ and F₁ ✓

Meiosis and fertilization ✓

(✓***Compulsory** 1 + Any 6) (7)

(15)
[50]

**TOTAL SECTION B: 100
GRAND TOTAL: 150**