GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PREPARATORY EXAMINATION

2020

MARKING GUIDELINES

LIFE SCIENCES (PAPER 2) (10832)

13 pages

PRINCIPLES RELATING TO THE MARKING OF LIFE SCIENCES

1. **If more information than marks allocated is given**
   Stop marking when maximum mark 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 the whole process is given when only part of it is required**
   Read all and credit relevant parts.

4. **If comparisons are asked for and descriptions are given**
   Accept if 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-recognized 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 recognizable accept, 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 memo discussion meeting.

14. **If only letter is asked for and only 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 captions.

18. **Code-switching of official languages (terms and concepts)**
A single word or two that appears 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 may be made to the ratified memorandum without consultation with the Provincial Internal Moderator.

SECTION A

QUESTION 1

1.1	1.1.1	D✓✓		
	1.1.2	D✓✓		
	1.1.3	B✓✓		
	1.1.4	C✓✓		
	1.1.5	B✓✓		
	1.1.6	B✓✓		
	1.1.7	D✓✓		
	1.1.8	B✓✓		
	1.1.9	C✓✓	(9 x 2)	**(18)**
1.2	1.2.1	Incomplete dominance ✓		
	1.2.2	Non-disjunction ✓		
	1.2.3	Opposable thumb ✓		
	1.2.4	Haemophilia✓		
	1.2.5	Testes ✓		
	1.2.6	Prophase 1✓		
	1.2.7	*Homo* ✓		
	1.2.8	Stem✓cell		
	1.2.9	Theory ✓	(9 x 1)	**(9)**
1.3	1.3.1	Both A and B✓✓		
	1.3.2	A only ✓✓		
	1.3.3	None ✓✓	(3 x 2)	**(6)**

1.4	1.4.1	(a)	Cradle of Humankind✓	(1)
		(b)	(Great) Rift Valley✓	(1)
	1.4.2		*Ardipithecus*✓	(1)
	1.4.3	(a)	*Australopithecus afarensis* ✓	(1)
		(b)	*Australopithecus africanus* ✓	(1)
	1.4.4		curved✓/S-shaped	(1)
	1.4.5		Mrs Ples ✓	(1)
			Little foot ✓	(1)
	1.4.6		*Sediba*✓/*Australopithecus sediba/Karabo*	(1) **(9)**
1.5	1.5.1		Metaphase 1 ✓	(1)
	1.5.2		**X -** chromatid ✓	(1)
			Y - centromere ✓	(1)
			Z - cell membrane ✓/plasmalemma	(1)
	1.5.3		– crossing-over ✓ – random arrangement of chromosomes ✓	(2)
	1.5.4	(a)	blonde✓ hair	(1)
		(b)	BbFf ✓/FfBb	(1) **(8)**
			TOTAL SECTION A:	**50**

SECTION B

QUESTION 2

2.1 2.1.1 The breeding of selected plants and animals✓ to produce traits that are beneficial to humans ✓ (2)

2.1.2
– calving difficulty ✓
– reduced stress tolerance ✓
– reduced fertility ✓
– reduced calf survival ✓
Mark first TWO only (Any 2) (2)

2.1.3 The disorder caused more muscle/meat to be produced✓
This increases the yield✓
Which is of economic✓ benefit to the farmer (3)

2.1.4 P_1 Phenotype normal bull x normal cow ✓
Genotype Nn x Nn ✓
Meiosis
G/gametes N , n x N , n ✓
Fertilization
F_1 Genotype NN Nn Nn nn ✓
Phenotype 3 normal: 1 with muscular hypertrophy ✓
P_1 and F_1 ✓
Meiosis and fertilisation ✓ (Any 6)

OR

P_1 Phenotype normal bull x normal cow ✓
Genotype Nn x Nn ✓
Meiosis
N , n x N , n ✓
Fertilization

G/gametes	N	n
N	NN	Nn
n	Nn	nn

1 mark for correct gametes
1 mark for correct genotypes

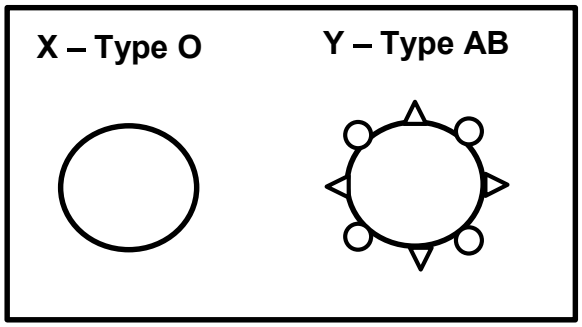
F_1 Phenotype 3 normal: 1 with muscular hypertrophy ✓
P_1 and F_1 ✓
Meiosis and fertilisation ✓ (Any 6) (6)

2.1.5
- The recessive allele is found in 100%/all 4 of the F1 generation✓
- and therefore, if they are crossbred, there will be more homozygous recessive ✓ individuals in the next generation
- who will have the condition✓
- and the frequency of the disorder will increase (3)

(16)

2.2 2.2.1 Type **O**✓ and Type **AB**✓ (2)

2.2.2 Diagram showing the blood cells for blood types O and AB



Criteria for assessing the diagram

Caption naming both types of blood correctly	H	1
Correct diagrams showing the lack of antigens in one and presence of both types of antigens in the other	D	2 marks: both correct 1 mark : 1 correct
Each diagram correctly labelled	L	2 marks: both correct 1 mark: 1 correct

(5)

(7)

2.3 2.3.1 Yes✓ he is the biological father. (1)

2.3.2
- Every band/bar in the child's profile✓
- that did not match that of the mother✓
- must match that of the father✓

OR

- Every band/bar in the child's profile that matches with the mother's bands/bars are excluded✓
- all the remaining bands/bars of the child's profile ✓
- must match with the father ✓ (3)

2.3.3
- Identify criminals ✓
- Identifying dead bodies ✓
- Finding lost relatives ✓
- Diagnosing a genetic disorder ✓
- Finding a potential cure for genetic diseases ✓

Mark first TWO only (Any 2) (2)
(6)

2.4 2.4.1 Male squirrel monkeys can only see red or green✓✓/are either red or green colour blind/have dichromatic vision.

OR

Male squirrel monkeys with the genotype $X^G Y$ can only see green✓/are red colour-blind and
Male squirrel monkeys with the genotype $X^R Y$ can only see red✓/are green colour-blind (2)

2.4.2
- Better vision for foraging✓ to see insects and fruit
- To distinguish between leaves and fruit✓
- To distinguish between ripe and unripe fruit✓
- To avoid predators✓

Mark first ONE only (Any 1) (1)

2.4.3 Females inherit TWO X chromosomes✓
which could both carry the same alleles ✓/$X^R X^R$ **or** $X^G X^G$ (2)
(5)

2.5 2.5.1 A – Tt ✓
B – tt ✓ (2)

2.5.2 C✓ (1)

2.5.3
- Individual C is heterozygous because she has the condition✓/has a dominant allele/has (T)
- both of her offspring don't have the condition✓/are homozygous recessive/are tt (2)

2.5.4 25✓% (1)
(6)
[40]

QUESTION 3

3.1 3.1.1
- Penguins have few natural predators on land✓
- There is less prey available on land✓

Mark first ONE only (Any 1) (1)

3.1.2
- They could escape predators✓ and
- find food easily ✓ (2)

3.1.3
- There was variation in the wings of the penguin✓
- Some were long with light bones✓
- and some were short with heavy bones✓
- Those with long wings and light bones were unable to obtain food/escape predators✓
- and they died✓
- Those with short wings and heavy bones were better able to find food/escape predators✓
- and they survived and reproduced✓
- passing on the characteristics✓ of short wings and heavy bones (Any 6) (6)

(9)

3.2
- Punctuated equilibrium explains the speed at which evolution takes place✓
- **A** shows a long period of time✓*
- where species do not change✓/change very little
- This is known as equilibrium✓
- This alternates with a shorter period of time shown at **B** ✓ *
- where rapid changes✓ through natural selection occur
- during which new species may form in a short period of time ✓

(2 compulsory* + Any 3) **(5)**

3.3 3.3.1
- Speciation through geographical isolation✓*occurred
- the rocky island✓*/a geographical barrier
- separated the fish into two populations✓
- there is no gene flow between the two populations✓
- with different environmental conditions✓/selection pressures on each side
- natural selection occurs independently✓ in each population
- Each population became genotypically and phenotypically different✓ from the other
- which prevented them from interbreeding✓ leading to the formation of a new species

(2 compulsory* + Any 4) (6)

3.3.2
- Male and female fish of a particular species only become sexually receptive✓/active/mature
- during certain times of the year✓/season
- Other species may not be sexually mature✓/have a different breeding seasons
- therefore, they are unable to interbreed✓/mate with any other species of fish thereby keeping the species separate

(Any 3) (3)
(9)

3.4 3.4.1 **A**✓ (1)

3.4.2
- Bipedal organisms have a **short** and **wide** ✓pelvis
- to support the upper body weight✓ (2)

3.4.3

Organism A	Organism B
Large cranium✓	Small cranium✓
Flat face✓/less sloping forehead	Sloping face ✓
Brow ridges not pronounced✓	Brow ridges pronounced ✓
Well-developed chin✓	Poorly developed chin✓
Small jaws✓	Large jaws✓
Less protruding jaws ✓ /prognathous jaw	More protruding jaw✓/ prognathous jaw
Small teeth✓/canines	Large teeth✓/canines
Foramen magnum in a more forward position✓	Foramen magnum in a backward position✓

Mark first TWO only (Any 2 x 2 + 1 table) (5)
(8)

3.5 3.5.1 "Out of Africa" ✓hypothesis (1)

3.5.2
- Mitochondrial DNA (mtDNA)✓ is only inherited through the maternal line✓/passed from mother to offspring
- analysis of the mutations on the mtDNA✓
- shows that Africa was the location of the oldest female ancestor✓/mitochondrial Eve
- and that all humans descended from her✓

Any 4 (4)

3.5.3
- Fossils of *Ardipithecus* were found only in Africa ✓/Rift Valley/Ethiopia/South Africa.
- Fossils of *Australopithecus* were found only in Africa ✓/Rift Valley/Ethiopia/South Africa.
- The fossils of *Homo habilis* were found only Africa.✓
- The oldest fossils of *Homo erectus* were found in Africa.✓
- The oldest fossils of *Homo sapiens* were found in Africa.✓

(Any 4) (4)
(9)
[40]

TOTAL SECTION B: 80

SECTION C
QUESTION 4

During transcription (N)
– The double helix DNA unwinds ✓ and
– the double-stranded DNA unzips ✓/weak hydrogen bonds break
– to form two separate strands exposing the gene ✓
– One strand is used as a template✓
– to form mRNA✓
– using free RNA nucleotides✓ from the nucleoplasm
– The mRNA is complementary to the DNA✓/A bonds with U and G bonds with C
– the mRNA now has the coded message for protein synthesis✓
– The mRNA leaves the nucleus ✓ through the nuclear pore
– and attaches to the ribosome ✓ (Any 8)

During translation (R)
– Each tRNA carries a specific amino acid✓
– When the anticodon on the tRNA✓
– matches the codon on the mRNA✓
– then tRNA brings the required amino acid to the ribosome✓
– Amino acids become attached by peptide bonds✓
– To form the required protein ✓ (Any 5)

Gene Mutation (G)
– A mutation would change the sequence of nitrogenous bases/nucleotides on the DNA molecule✓ resulting in
– A changed sequence of codons✓/N-bases on the mRNA molecule
– The anticodon on the tRNA would not match✓
– And therefore, bring the incorrect amino acid✓
– Resulting in a different sequence of amino acids✓ and
– A different protein being formed ✓ (Any 4)

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

NOTE: NO marks will be awarded for answers in the form of flow charts, tables, or diagrams.

ASSESSING THE PRESENTATION OF THE ESSAY

Criterion	Relevance (R)	Logical sequence (L)	Comprehensive (C)
Generally	All information provided is relevant to the topic.	Ideas are arranged in a logical/ cause-effect sequence.	All aspects required by the essay have been sufficiently addressed.
In this essay	Only information relevant to: - Transcription; - Translation and - Protein change due to a gene mutation	Ideas are expressed in a logical sequence in each of the following: – Transcription – Translation – Protein change due to a gene mutation	Obtained at least the following: – Transcription: 6/8 – Translation: 3/5 – Protein change due to a gene mutation: 2/4
Mark	1	1	1

TOTAL SECTION C: 20
TOTAL 150