



**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

SEPTEMBER 2023

**LIFE SCIENCES P2
MARKING GUIDELINE**

MARKS: 150

This marking guideline consists of 11 pages.

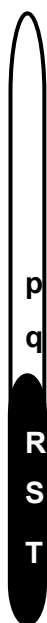
PRINCIPLES RELATED TO MARKING LIFE SCIENCES

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. 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 C ✓✓
 1.1.3 A ✓✓
 1.1.4 B ✓✓
 1.1.5 D ✓✓
 1.1.6 A ✓✓
 1.1.7 B ✓✓
 1.1.8 D ✓✓
 1.1.9 A ✓✓
 1.1.10 C ✓✓ (10 x 2) (20)
- 1.2 1.2.1 Chromosomes ✓
 1.2.2 Gene ✓
 1.2.3 (Gregor) Mendel ✓
 1.2.4 Peptide ✓ bond
 1.2.5 Nucleotides ✓
 1.2.6 Stem cells ✓
 1.2.7 Prognathous ✓
 1.2.8 Punctuated equilibrium ✓ (8 x 1) (8)
- 1.3 1.3.1 A only ✓✓
 1.3.2 B only ✓✓
 1.3.3 A only ✓✓ (3 x 2) (6)
- 1.4.1 Crossing over ✓ (1)
- 1.4.2 Prophase 1 ✓ (1)
- 1.4.3 (a) Centromere ✓ (1)
 (b) Chromatid ✓ (1)
 (c) Homologous chromosomes ✓ (1)
- 1.4.4

**Mark allocation**

Single chromatid drawn ✓

Chromatid white/unshaded at top and shaded at bottom ✓

Correct letters (p q R S T) on chromatid ✓

(3)

- 1.5 1.5.1 Dihybrid cross ✓ (1)
- 1.5.2 GB Gb gB gb ✓ (1–3 correct) ✓✓(all 4 correct) (2)
- 1.5.3 (a) Grey ✓ (1)
(b) ggbb ✓✓ (2)
(c) Grey hair ✓ Black eyes ✓ (2)
(8)

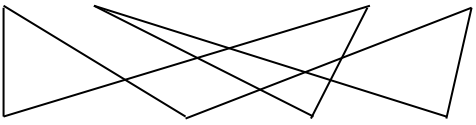
TOTAL SECTION A: 50

QUESTION 2

- 2.1 2.1.1 (a) DNA ✓ (1)
(b) mRNA ✓ (1)
- 2.1.2 Transcription ✓ (1)
- 2.1.3 Nucleus ✓ (1)
- 2.1.4 A C G ✓ G C G ✓ U G G ✓ (3)
- 2.1.5 Cysteine ✓ – Valine ✓ – Threonine ✓ (3)
- 2.1.6 - The mRNA/codon/base is GCG/C instead of GUG/U on molecule 2 ✓
- Therefore, the tRNA/anticodon will be CGC ✓ instead of CAC.
- Therefore, the amino acid will be Alanine ✓ instead of Valine
- Therefore, a different protein will be coded for. ✓ (4)
- 2.2 2.2.1 (a) X^n ✓ (1)
(b) $X^n X^n$ ✓✓ (2)
- 2.2.2 - They struggle to see clearly at night ✓
- They experience visual problems like short-sightedness ✓
- Loss of visual sharpness ✓
(Mark first TWO only) (Any 2 x 1) (2)
- 2.2.3 (a) Normal night vision ✓ (1)
(b) - A man/boy has only one X chromosome ✓
- The son will get his X chromosome from his mother ✓
- If the mother's X chromosomes are both for normal night vision ✓ then the boy will not have night blindness. (3)
- 2.3 2.3.1 - **All** the black bars of the DNA profile of the child ✓
- that do not match the DNA profile of the mother ✓
- match the DNA profile of dad 2 ✓ (3)
- 2.3.2 - The baby carries two recessive alleles ✓/ is ii
- Dad 1 carries the allele for blood type A/ I^A and the allele for blood type B/ I^B . ✓
- Therefore, he cannot pass on the allele for blood type O ✓/ i to the child

OR

- The baby carries two recessive alleles ✓ (one from each parent)
- The mother has one recessive allele ✓
- Dad 1 has no recessive allele ✓
- Therefore, he cannot pass on the allele for blood type O/i to the child (3)

2.3.3	P₁	Phenotype	Blood type A male/dad	x	Blood type B female/mother
		Genotype	I ^A i ✓	x	I ^B i ✓
	Meiosis	G/gametes	I ^A , i	x	I ^B , i ✓
	Fertilisation				
	F₁	Genotype	I ^A I ^B ; I ^A i ; I ^B i ; ii ✓		
		Phenotype	1 AB : 1 A : 1 B : 1 O		

They have a 25% ✓*chance of having a child with blood group O.

OR

P₁	Phenotype	Blood type A male/dad	x	Blood type B female/mother												
	Genotype	I ^A i ✓	x	I ^B i ✓												
Meiosis	G /gametes	I ^A , i	x	I ^B , i ✓												
Fertilisation		<table border="1"><tr><td>Gametes</td><td>I^A</td><td>i</td></tr><tr><td>I^B</td><td>I^AI^B</td><td>I^Bi</td></tr><tr><td>i</td><td>I^Ai</td><td>ii</td></tr><tr><td colspan="3">Correct genotypes ✓</td></tr></table>			Gametes	I ^A	i	I ^B	I ^A I ^B	I ^B i	i	I ^A i	ii	Correct genotypes ✓		
Gametes	I ^A	i														
I ^B	I ^A I ^B	I ^B i														
i	I ^A i	ii														
Correct genotypes ✓																
F₁																

Phenotype 1 AB : 1 A : 1 B : 1 O

They have a 25% ✓*chance of having a child with blood group O.

P₁ and F₁ ✓

Meiosis and fertilisation ✓

Any 5 + *1 Compulsory

(6)

- 2.3.4 - Many people have the same blood groups ✓
 - Therefore, blood groups can only tell us who is not the father ✓ (2)

- 2.3.5 - Determine the probability or causes of genetic defects
 - Establish the compatibility of tissue types for organ transplants
 - Identify relatives
 - Identify crime suspects in forensic investigations
(Mark first TWO only) (Any 2 x 1) (2)

2.4 2.4.1 Anaphase 1 ✓ (1)

2.4.2 - Homologous chromosomes separate ✓ and move to the poles

OR

- Whole/double thread chromosomes ✓ move to the poles ✓
(Mark first answer only) (Any 1 x 2) (2)

2.4.3 (a) Forms the spindle fibre ✓ (1)

(b) Pulls the chromosomes towards the poles ✓ (1)

2.4.4 Non-disjunction ✓ (1)

2.4.5 - Random arrangement ✓/ maternal and paternal chromosomes
arrange randomly on the equator
- This leads to a mixture of maternal and paternal information in the
gametes that form ✓

- Non-disjunction ✓/homologous chromosomes do not separate/
chromosomal mutation
- Therefore, one gamete will have an extra chromosome and the
other will have one less ✓

- Crossing over ✓ has occurred

- Therefore, chromosomes have a mixture of maternal and paternal
genetic information ✓

(Mark first TWO only) (Any 2 x 2) (4)

2.4.6 3 ✓ (1)

[50]

QUESTION 3

3.1 3.1.1 Artificial Selection ✓/Selective breeding (1)

- 3.1.2 - Shorter and wider ✓
 - Pale brown fur with black stripes ✓
 - Stripes only on the front of their body ✓ (Any 2 x 1) (2)

- 3.1.3 - If they can interbreed ✓
 - and produce fertile offspring ✓ (2)

- 3.1.4 - Extinction of some species opens new ecological niches ✓
 - which may lead to the formation of new species ✓ (2)

3.2 3.2.1 *Homo naledi* ✓ (1)

3.2.2 It belongs to the same genus as modern humans ✓
(Mark first ONE only) (1)

- 3.2.3 - *Australopithecus sediba* would be bipedal if:
 - It had an S-shape spine ✓
 - The hips were wider and shorter ✓
 - The foramen magnum was in a forward position ✓
(Mark first THREE only) (3)

3.2.4 *Australopithecus africanus* ✓ (1)

- 3.2.5 - the site has produced a large number of hominin fossils ✓
 - in the human lineage ✓ (2)

- 3.2.6 - mtDNA is passed from mother to child ✓
 - By following mutations in mtDNA ✓
 - we can trace our female line of descent ✓
 - which leads to an ancestral female who lived in East Africa about 150 000 years ago ✓ (4)

3.3 3.3.1 Biological evolution is the change in the characteristics of species over time ✓✓ (2)

- 3.3.2 Theory of Evolution is regarded as a scientific theory since:
 - various hypotheses relate to evolution ✓
 - they have been tested and verified over time ✓ (2)

3.3.3

<u>HYPOTHESIS</u>	<u>THEORY</u>
possible prediction/explanation of phenomena after observation ✓	scientific explanation of events supported by results ✓
Based on limited data ✓	It is supported by a lot of evidence ✓
Hypothesis can either be accepted or rejected ✓	Theories are reliable and the basic ideas persist in science ✓

Any 1 x 2 + Table ✓

(Mark first ONE only) (3)

- 3.3.4 - genetics
 - biogeography
 - fossils
 - comparative anatomy
(Mark first TWO only) (Any 2 x 1) (2)
- 3.4 3.4.1 Genetic Engineering ✓/Genetic Modification (1)
- 3.4.2 Recombinant DNA ✓ (1)
- 3.4.3 - They will use less insecticide ✓
 - And therefore, save money ✓
 -
- OR**
- They will have a bigger crop yield ✓
 - And therefore, earn more money ✓
(Mark first ONE only) (Any 1 x 2) (2)
- 3.4.4 - The gene could kill other organisms ✓
 - that are useful to the environment ✓ and therefore, decrease biodiversity
(Mark first ONE only) (2)
- 3.5 3.5.1 treatment ✓ / oral or injectable containing (1)
- 3.5.2 They used 200 participants ✓
(Mark first ONE only) (1)
- 3.5.3 $100\checkmark - (28+12+2)\checkmark$ **OR** $100\checkmark - 42\checkmark$
 $= 58\checkmark$ participants (3)
- 3.5.4 - They stop going to the clinic ✓*
 - because they are scared of injection ✓
 - because they do not have transport ✓
 - because they forget ✓
 - because they move away ✓
(Mark first ONE only) ✓* + Any 1 (2)
- 3.5.5 - Some TB bacteria have resistance to rifampicin/drugs and some do not ✓
 - When rifampicin/drugs is given, ✓
 - the TB bacteria with resistance to rifampicin survives ✓
 - While the TB bacteria with no resistance to rifampicin dies. ✓
 - The TB bacteria that survive, reproduce ✓
 - and thus, pass on the allele for the resistance to rifampicin to their offspring ✓
 - The next generation will therefore have a higher proportion of individuals with rifampicin/drug resistance ✓ (Any 5 x 1) (5)

- 3.5.6 - Patients should be
- the same age ✓
- same economic level ✓
- same health ✓ / not have other diseases

(Mark first TWO only)

Any 2

(2)

- 3.5.7 - To ensure that the tuberculosis bacterium is completely killed ✓
- And the TB does not reoccur ✓

(2)

[50]

TOTAL SECTION B: 100

GRAND TOTAL: 150