Province of the
EASTERN CAPE
EDUCATION

Iphondo leMpuma Kapa: Isebe leMfundo
Provinsie van die Oos Kaap: Department van Onderwys
Porafensie Ya Kapa Botjahabela: Lefapha la Thuto

# NATIONAL SENIOR CERTIFICATE

## GRADE 12

## SEPTEMBER 2024

# 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.

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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.

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## SECTION A

## QUESTION 1

| | | | | |
|---|---|---|---|---|
| 1.1 | 1.1.1 | B ✓✓ | | |
| | 1.1.2 | D ✓✓ | | |
| | 1.1.3 | A ✓✓ | | |
| | 1.1.4 | A ✓✓ | | |
| | 1.1.5 | B ✓✓ | | |
| | 1.1.6 | C ✓✓ | | |
| | 1.1.7 | C ✓✓ | | |
| | 1.1.8 | D ✓✓ | | |
| | 1.1.9 | C ✓✓ | (9 x 2) | (18) |
| 1.2 | 1.2.1 | Karyotype ✓ | | |
| | 1.2.2 | Chloroplast ✓ | | |
| | 1.2.3 | Chiasma ✓/chiasmata | | |
| | 1.2.4 | (Blood group) O ✓ | | |
| | 1.2.5 | Locus ✓/loci | | |
| | 1.2.6 | Template ✓ | | |
| | 1.2.7 | Down syndrome ✓/trisomy 21 | | |
| | 1.2.8 | (Weak) hydrogen ✓ bonds | | |
| | 1.2.9 | Haploid ✓ | (9 x 1) | (9) |
| 1.3 | 1.3.1 | B only ✓✓ | | |
| | 1.3.2 | A only ✓✓ | | |
| | 1.3.3 | A only ✓✓ | (3 x 2) | (6) |
| | 1.4.1 | Genetic engineering ✓ | | (1) |
| | 1.4.2 | Plasmid ✓ | | (1) |
| | 1.4.3 | Enzyme ✓ | | (1) |
| | 1.4.4 | (a) Promotes skeletal and muscular growth ✓ | | (1) |
| | | (b) Produces insulin ✓ | | (1) |
| | 1.4.5 | Bacteria:<br>- Reproduce very rapidly ✓<br>- Reproduce asexually ✓/by mitosis<br>- Exists everywhere ✓<br>- Are simple organisms ✓<br>- DNA is in the form of a plasmid ✓<br>**(Mark first TWO only)** | | (2) |
| | 1.4.6 | Attach the gene for human growth hormone to structure **X** ✓/plasmid | | (1) |

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| | | | |
|---|---|---|---|
| 1.5 | 1.5.1 | Punctuated equilibrium ✓ | (1) |
| | 1.5.2 | - (Niles) Eldredge ✓<br>- (Stephen) Gould ✓ | (2) |
| | 1.5.3 | (a) 1 ✓ | (1) |
| | | (b) 2 ✓ | (1) |
| | | (c) 1✓ | (1) |
| | 1.5.4 | A – organisms do not evolve/change ✓/remain the same<br>B – organisms rapidly evolve/change ✓ | (2) |
| | 1.5.5 | Biological ✓evolution | (1) |

**TOTAL SECTION A: 50**

Stanmorephysics.com

**QUESTION 2**

2.1 2.1.1 Prophase I ✓ (1)

2.1.2 (a) Centriole ✓/centrosome (1)
(b) Homologous ✓ chromosomes (1)
(c) Anaphase II ✓ (1)

2.1.3 6 ✓ (1)

2.1.4 DNA is made-up of:
- deoxyribose sugar ✓
- phosphate ✓ and
- nitrogenous base ✓ (Any 2) (2)

2.1.5
- DNA replication ✓*
- Chromosomes which were single threads become double ✓
- each chromosome will now consist of two chromatids joined by a centromere
- Doubling the genetic material ✓

**Compulsory mark ✓* 1** + Any 2 (3)

2.1.6
- Part D/spindle fibre attaches to homologous chromosomes✓
- At the centre ✓/equator of the cell
- Causing random arrangement ✓ of homologous chromosomes
- Leading to further genetic variation ✓/new combinations (Any 3) (3)

2.2 Translation ✓*
- 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 to each other by peptide bonds. ✓

**Compulsory mark ✓* 1** + Any 4 (5)

2.3 2.3.1
- Human embryos ✓
- Umbilical cord ✓
- Bone marrow ✓
- Placental tissue ✓
- Adult stem cells ✓
- Teeth ✓
- Skin ✓
- Amniotic fluid ✓

**(Mark first TWO only)** (2)

2.3.2 Macular degeneration ✓ (1)

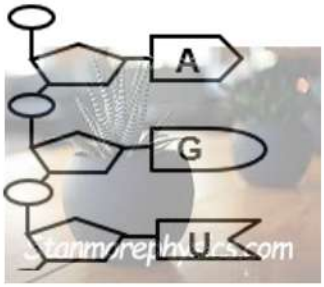
2.3.3 4 ✓/four (1)

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2.3.4 (a) Valine ✓ (1)

(b) - the DNA triplet will be ACG ✓ instead of ACC
- the codon will be UGC ✓ instead of UGG
- the amino acid will be cysteine ✓ instead of tryptophane (3)

(c) **mRNA**




**Guidelines for marking the drawing.**

| Criteria | Mark |
|---|---|
| Correct caption **(H)** | 1 |
| One strand drawn **(D)** | 1 |
| 3 nucleotides drawn in correct positions **(N)** | 1 |
| Correct codon / 3 correct nitrogenous bases **(C)** | 1 |

(4)

2.4.1 - A gene ✓
- located on chromosomes 1–22 ✓/non-sex chromosomes
- Two copies of the mutated gene/allele cause the condition ✓

(Any 2) (2)

2.4.2 H ✓ (1)

2.4.3 - Child H inherited one recessive allele ✓/b
- From each parent ✓ (2)

2.4.4 Complete ✓ dominance (1)

2.4.5 - K, L, M are heterogygous ✓/Bb
- And therefore unaffected ✓ with Leigh sydrome
- The dominant allele/B masks the expression of the recessive allele ✓/b (3)

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2.5.1 Female ✓ with fragile X syndrome ✓ (2)

2.5.2
- Fragile X syndrome is caused by a dominant allele on the X-chromosome ✓/$X^R$
- Both males and females need only one dominant allele ✓/$X^R$ to be affected (2)

2.5.3

| | | | | |
|---|---|---|---|---|
| **$P_1$** | Phenotype | Male with fragile X ✓ | x | Female without fragile X ✓ |
| | Genotype | $X^RY$ | x | $X^rX^r$ |
| Meiosis | | | | |
| | **G**/gametes | $X^R$ , Y | x | $X^r$ , $X^r$ ✓ |
| Fertilisation | | | | |
| **$F_1$** | Genotype | $X^RX^r$ ; $X^R X^r$ ; $X^rY$ ; $X^rY$ ✓ | | |
| | Phenotype | 2 females with fragile X : 2 males without fragile X syndrome ✓ | | |

They have a 0**%** ✓*chance of having a son with fragile X syndrome.

**OR**

| | | | | |
|---|---|---|---|---|
| **$P_1$** | Phenotype | Male with fragile X ✓ | x | Female without fragile X ✓ |
| | Genotype | $X^RY$ | x | $X^rX^r$ |
| Meiosis | | | | |
| | **G**/gametes | $X^R$ , Y | x | $X^r$ , $X^r$ ✓ |

Fertilisation
**$F_1$**

| Gametes | **$X^R$** | **Y** |
|---|---|---|
| **$X^r$** | $X^R X^r$ | $X^r Y$ |
| **$X^r$** | $X^R X^r$ | $X^r Y$ |
| Correct genotypes ✓ | | |

Phenotype: 2 females with fragile X : 2 males without fragile X syndrome ✓

They have a 0% ✓*chance of having a son with fragile X syndrome.

$P_1$ and $F_1$ ✓
Meiosis and fertilisation ✓ **Any 6 + *1 Compulsory** (7)
**[50]**

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**QUESTION 3**

3.1 3.1.1 There are two characteristics being crossed ✓ (1)

3.1.2 Artificial selection ✓/ Selective breeding (1)

3.1.3 To obtain a desired characteristic ✓ (1)

3.1.4 (a) bbhh ✓✓ (2)

(b) BH Bh Bh bh ✓(1–3 correct) ✓✓ (All 4 correct) (2)

3.1.5 9 : 3 : 3 : 1 ✓✓

**OR**

9 baby hair coat with smooth hair
3 baby hair coat with curly hair
3 black hair coat with smooth hair
1 black hair coat with curly hair
✓✓ (2)

3.2 3.2.1 Non-existent by 2035 ✓ (1)

3.2.2 (a) - Habitat loss ✓
- Overfishing of their main food sardines ✓
**(Mark first TWO only)** (2)

(b) - Breeding at different times of the year ✓
- (Species-specific) courtship behaviour ✓
**(Mark first TWO only)** (2)

3.2.3 (a) - Less sardines will be sold ✓/decrease in profit
- leading to unemployment ✓/job losses

**OR**

- Money will be spent on other expensive sources of protein ✓ /meat
- Reducing spending on other food items ✓
**(Mark first ONE only)** (1 x 2) (2)

(b) - More sardines/food will be available ✓
- More African penguins will survive ✓/not die
**(Mark first ONE only)** (1 x 2) (2)

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 x 1) (7)

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3.4 3.4.1 *Australopithecus Africanus* ✓ (1)

3.4.2 (a) C ✓ (1)

(b) D ✓ (1)

(c) A ✓ (1)

3.4.3 - Shape of B/pelvis is shorter and wider than that of primitive apes ✓
- and slightly taller and narrow compared to the human ✓ pelvis. (2)

3.4.4 - The cranium size increased ✓ in modern humans
- To allow more intelligence ✓/process more information (2)

3.4.5 (a) Genetic ✓/mtDNA (1)

(b) - Fossils of Australopithecus were found in Africa ONLY ✓
this suggest that ancestors of homo sapiens originated in Africa ✓ (2)

3.5 3.5.1 To determine if the individuals who made the Laetoli footprints walked using a human-like bipedalism or a more ape-like movement (bent-knee, bent-hip). ✓ (1)

3.5.2 Toe depth ✓ (1)

3.5.3 - Obtain permission from participants. ✓
- Decide on sample size. ✓
- Decide on the measuring tool ✓/materials to be used.
- Decide on how results will be recorded. ✓
- Decide on time ✓/date to conduct the investigation

**(Mark first THREE only)** (3)

3.5.4 - Investigation was done once ✓/not repeated
- Sample size consists of 8 participants ✓ (2)

3.5.5 Ape-like movement ✓ (1)

3.5.6 $\frac{2,2}{11}$ ✓ 2 ✓ times (2)

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3.5.7

| TYPE OF FOOTPRINT | TOE DEPTH (cm) |
|---|---|
| Ape-like movement | 6 |
| Human-like bipedalism | 2,2 |
| Laetoli | 1,1 |

**Criteria for marking the table.**

| Criteria | Mark allocation |
|---|---|
| Correct table format **(T)**<br>(Separation of columns) | 1 |
| Column headings **(H)** | 1 |
| Data entered **(E)**<br>1–2 data sets are entered correctly<br>All 3 data sets are entered correctly | 1<br>2 |

(4)
**[50]**

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

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