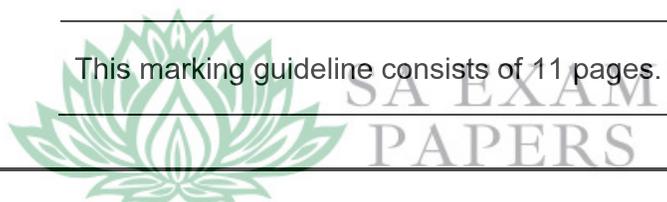**NATIONAL
SENIOR CERTIFICATE**

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.

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   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:
                 -    Reproduce very rapidly ✓
                 -    Reproduce asexually ✓/by mitosis
                 -    Exists everywhere ✓
                 -    Are simple organisms ✓
                 -    DNA is in the form of a plasmid ✓
         (Mark first TWO only)   (2)

         1.4.6   Attach the gene for human growth hormone to structure **X** ✓/plasmid   (1)

1.5   1.5.1   Punctuated equilibrium ✓   (1)

        1.5.2   -   (Niles) Eldredge ✓
                     -   (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
                  B – organisms rapidly evolve/change ✓   (2)

        1.5.5   Biological ✓evolution   (1)

TOTAL SECTION A: 50

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**
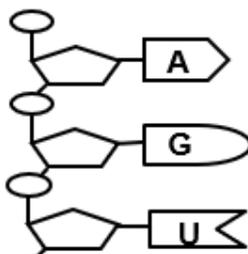
Guidelines for marking the drawing.

Criteria	Mark
Correct caption **(H)**	1
One strand drawn **(D)**	1
3 nucleotides drawn in correct positions **(N)**	1
Correct codon *I* 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)

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   **P₁**   Phenotype   Male with   x Female without
                                 fragile X ✓   fragile X ✓

                     Genotype X^RY x X^rX^r

         Meiosis

                     G/gametes X^R, Y   x X^r, X^r ✓

         Fertilisation

         F₁   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

         P₁   Phenotype   Male with   x Female without
                                 fragile X ✓   fragile X ✓

                     Genotype X^RY x X^rX^r

         Meiosis

                     G/gametes X^R,   Y   x X^r, X^r ✓

         Fertilisation
         F₁

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.

         P₁ and F₁ ✓
         Meiosis and fertilisation ✓   **Any 6 + *1 Compulsory**   (7)
                                                                        [50]

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)

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 <u>ONLY</u> ✓
                 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)

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)** (Separation of columns)	1
Column headings **(H)**	1
Data entered **(E)** 1–2 data sets are entered correctly All 3 data sets are entered correctly	1 2

(4)

[50]

TOTAL SECTION B: 100
GRAND TOTAL: 150