SENIOR CERTIFICATE EXAMINATIONS

LIFE SCIENCES P2

2017

MARKING GUIDELINES

MARKS: 150

These marking guidelines consist 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. 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 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 is applicable to all official languages.

19. **Changes to the memorandum**
     No changes must be made to the memoranda. The provincial internal moderator must be consulted, who in turn will consult with the national internal moderator (and the Umalusi moderators where necessary).

20. **Official memoranda**
     Only memoranda bearing the signatures of the national internal moderator and the Umalusi moderators and distributed by the National Department of Basic Education via the provinces must be used.

SECTION A

QUESTION 1

1.1   1.1.1   A✓✓
          1.1.2   B✓✓
          1.1.3   A✓✓
          1.1.4   C✓✓
          1.1.5   C✓✓
          1.1.6   NO CORRECT ANSWER
          1.1.7   D✓✓
          1.1.8   C✓✓
          1.1.9   D✓✓
          1.1.10   C✓✓   (9 x 2)   **(18)**

1.2   1.2.1   Locus✓
          1.2.2   *Australopithecus*✓
          1.2.3   Pedigree✓ diagram
          1.2.4   Peptide✓ bond
          1.2.5   Interphase✓
          1.2.6   *(Homo) habilis*✓
          1.2.7   Stem✓/ meristematic cells
          1.2.8   Artificial selection✓/selective breeding   (8 x 1)   **(8)**

1.3   1.3.1   Both A and B✓✓
          1.3.2   Both A and B✓✓
          1.3.3   None✓✓   (3 x 2)   **(6)**

1.4   1.4.1   B- Cranium ✓
                   C- Brow ridge✓   (2)

          1.4.2   Canine✓   (1)

          1.4.3   (a) I✓ ; II✓   **(Mark first TWO only)**   (2)
                   (b) II✓   **(Mark first ONE only)**   (1)
                   (c) III✓   **(Mark first ONE only)**   (1)
                   (d) III✓   **(Mark first ONE only)**   (1)

          1.4.4   C✓   (1)

          1.4.5   III → I → II✓✓   (2)
                                                            (11)

1.5   1.5.1   100✓%   (1)

          1.5.2   Non-haemophiliac female ✓/Normal female   (1)

          1.5.3   (a) X^hY ✓   (1)
                   (b) $X^H X^h$ ✓✓   (2)
                                                        (5)

                                             TOTAL SECTION A: 50

QUESTION 2

2.1   2.1.1   mRNA✓/messenger RNA   (1)

       2.1.2   (a) Nitrogenous base✓   (1)
                (b) Ribose✓   (1)

       2.1.3   - The double stranded DNA molecule unwinds✓
                - and unzips✓/separates
                - when the hydrogen bonds break ✓
                - 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-U, C-G
                - This process is controlled by enzymes✓   Any 5   (5)
                                                                               (8)

2.2   2.2.1   - Crossing over✓
                - Random arrangement of chromosomes✓/   ⎫ OR
                  Independent/random assortment of chromosomes ⎭ meiosis✓
                - Random fertilisation✓
                - Random mating✓   Any 3   (3)
                (Mark first THREE only)

       2.2.2   - Continuous variation occurs when there is a range of phenotypes
                  for the same characteristic✓/has intermediate forms,
                - whereas discontinuous variation occurs when phenotypes fit into
                  separate or distinct categories✓/with no intermediate forms   (2)
                                                                               (5)

2.3   2.3.1   (a) GGT✓   (1)
                (b) AAA✓   (1)
                (c) UCA✓   (1)

       2.3.2   (a) 1✓   (1)
                (b) 198✓   (1)
                (c) 66✓   (1)

       2.3.3   - One of the base triplets on the DNA has changed✓
                - from ACG to ACC✓
                - The triplet ACG codes for the amino acid cysteine✓
                - while the triplet ACC codes for the amino acid tryptophan✓
                - resulting in a change in the sequence of amino acids✓   Any 4   (4)
                                                                               (10)

2.4   2.4.1   (a)   Temperature✓ (1)
                 (b)   Number of clover plants that survived✓/percentage survival (1)

        2.4.2   - Repeat the investigation✓
                     - Set up more greenhouses✓ at each temperature
                     - Use a larger sample of clover plants✓
                     - Increase the period of the investigation✓   Any 2   (2)
                     (Mark first TWO only)

        2.4.3   They counted the number of clover plants that survived and divided
                     it by the original number✓/200
                     then multiplied it by 100✓ (2)

        2.4.4   - The hypothesis will be accepted✓
                     - because there are more✓ clover plants/higher percentage
                       survival
                     - at the higher temperature✓
                                OR
                     - The hypothesis will be accepted✓
                     - because there are fewer✓ clover plants/ lower percentage
                       survival
                     - at the lower temperature✓ (3)

        2.4.5   - The bitter taste✓of the cyanide in the clover plants
                     - prevents herbivores/predators✓ from feeding on them (2)

        2.4.6   - The mutation caused variation✓ amongst the clover plants
                     - Some produce cyanide✓ and
                     - others do not produce cyanide✓
                     - The cyanide-producing plants are killed at lower temperatures✓
                     - The non-cyanide-producing plants survive at the lower
                       temperatures✓   and reproduce
                     - The allele for cyanide production is not passed on to the next
                       generation✓
                     - decreasing the number of cyanide producing clover plants✓ in
                       the next generation   Any 6   (6)
                                                       (17)
                                                    [40]

QUESTION 3
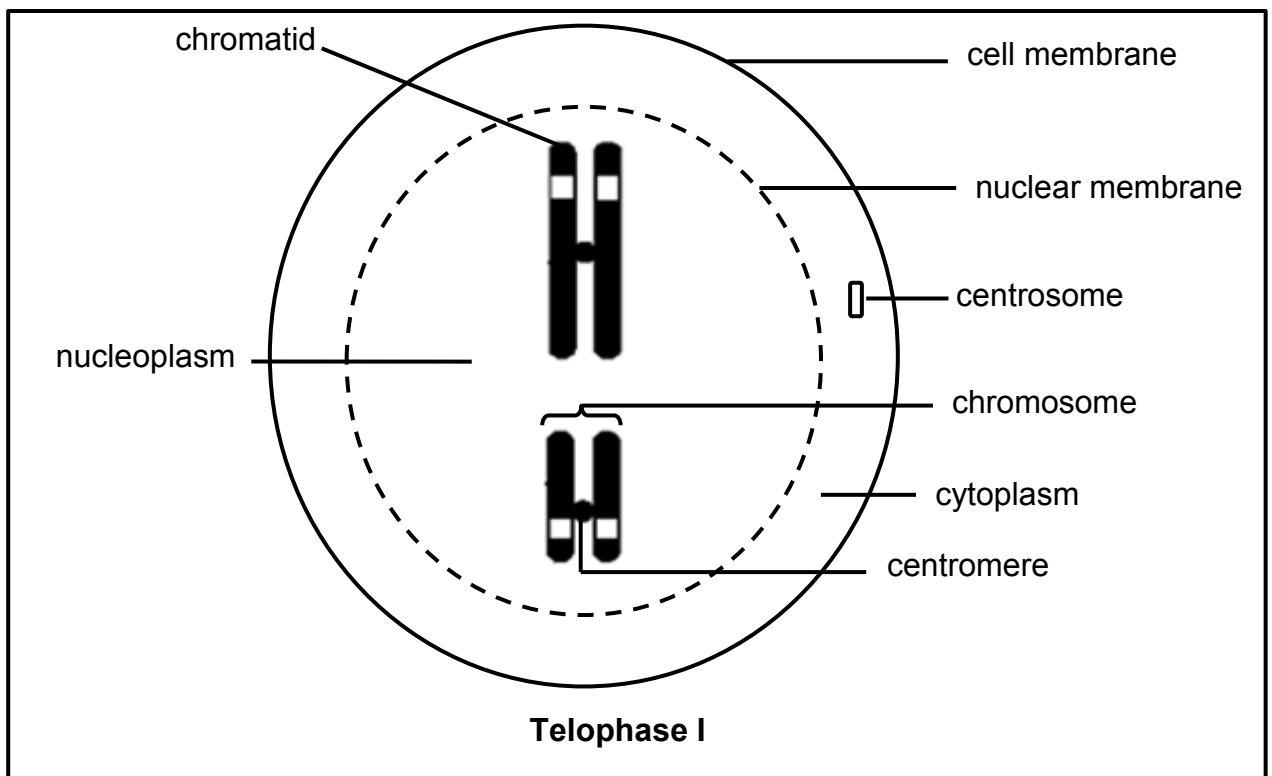
3.1   3.1.1   - A pair of chromosomes that are similar in length✓
                  - Carry genes for the same characteristics✓
                  - Have alleles at the same loci✓
                  - Have the same centromere position✓
                  - One is obtained from each parent✓   Any 2   (2)
                  (Mark first TWO only)

       3.1.2   Spindle fibre✓   (1)

       3.1.3   (a) 8✓   (1)
                   (b) 4✓   (1)

       3.1.4

Telophase I

Criteria to mark diagram

Single cell is drawn	(S)	1
Only 2 replicated chromosomes in drawing	(T)	1
One replicated chromosome longer than the other	(L)	1
Caption		1
Any TWO correct labels		2

                                                            (6)

       3.1.5   (a)   RrTt✓   (1)

                   (b)   RT, rt✓✓   (2)
                                                                 (14)

3.2

P₁   Phenotype   Blood type A   x   Blood type B✓*

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   Blood type AB   Blood type O ✓

P₁ and F₁✓
Meiosis and fertilisation✓

OR

P₁   Phenotype   Blood type A   x   Blood type B✓*

Genotype   I^A i   x   I^B i✓*

Meiosis

Fertilisation

Gametes	I^A	i
I^B	I^A I^B	I^B i
i	I^A i	ii

1 mark for correct gametes
1 mark for correct genotypes

F₁   Phenotype   Blood type AB and Blood type O ✓

P₁ and
F₁✓
Meiosis and fertilisation✓   **(6)**

*compulsory 2 + any 4

3.3   3.3.1   DNA profiling✓ (DNA fingerprinting)   (1)

        3.3.2   Male 3✓   (1)

        3.3.3   - The bands of the child's DNA is a combination of the DNA from
              each parent ✓
            - Three bands are identical to that of the mother✓
            - The remaining (three) bands correspond with that of male 3✓   (3)

        3.3.4   - To investigate crimes✓/resolve disputes
            - To identify organisms from their remains✓
            - To identify missing persons✓
            - To identify family relationships other than paternity✓ e.g. siblings
              or cousins
            - To test for the presence of specific alleles✓/genes that cause a
              genetic disorder
            - To establish matching tissues for organ transplants✓   Any 2   (2)
            (Mark first TWO only)   **(7)**

3.4   3.4.1   Genetic engineering✓/modification/manipulation/recombinant DNA technology   (1)

3.4.2
- Can kill other useful insects✓
- Can cause pollution✓
- May cause harm to consumers of the produce✓
- Development of insecticide-resistant organisms✓   Any 1   (1)
(Mark first ONE only)

3.4.3
- Use the same field✓/greenhouse
- Use the same number of plants✓
- Use the same species of wheat✓
- Measure the crop yield over the same period✓
- Use same techniques of measuring the crop yield✓   Any 2   (2)
(Mark first TWO only)

3.4.4   50✓   (1)

3.4.5   Difference in yield: $(70 – 45)$✓ $= 25$✓   (2)

3.4.6
- In the greenhouses high yield✓
- In the fields low yield✓   (2)

3.4.7
- The conditions in the greenhouse can be controlled ✓
- whereas there are many variations in the conditions for wheat grown in fields✓

<div align="center">OR</div>

The environmental conditions✓/ (examples) in the greenhouse may have differed✓from that in the field   (2)

3.4.8
- Expensive✓/research money could be used for other needs
- Potential health impacts✓
- Interfering with nature✓
- Not sure of long-term effects✓
- Did not increase the yield✓   Any 2   (2)
(Mark first TWO only)

                                 (13)

                                 [40]

                      TOTAL SECTION B: **80**

SECTION C

QUESTION 4

Differences
- A species is a group of organisms with similar characteristics ✓**D**
- that are able to interbreed ✓**D**
- to produce fertile offspring ✓**D**
- A population is a group of organisms of the same species ✓**D**
- found in the same habitat ✓**D**
- at the same time ✓**D**

Speciation by geographic isolation
- A population of organisms becomes split ✓**S**
- by a geographical barrier ✓**S**/example of a geographical barrier.
- The two populations cannot interbreed ✓**S**/there is no gene flow between the two.
- Natural selection occurs independently ✓**S** in each population.
- Due to different environmental conditions ✓**S** on either side of the barrier,
- the two populations become genotypically and phenotypically✓**S**
- different ✓**S** from each other.
- Even if the geographical barrier is removed, the individuals will not be able to interbreed ✓**S**
- We say that the original population has now become two separate species✓**S**

Effect of speciation and extinction on biodiversity
- Since there is an increase in the number of species ✓**B**
- speciation increases ✓**B** biodiversity
- Extinction results in the loss of the number of species ✓**B**
- therefore results in a decrease ✓**B** in biodiversity   Any 17

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

Criterion	Relevance (R)	Logical sequence (L)	Comprehensive (C)
Generally	All information provided is relevant to the question	Ideas are arranged in a logical/cause-effect sequence	All aspects required by the essay have been sufficiently addressed
In this essay in Q4	Only information relevant to the differences between population and species; the description of speciation and effect of speciation and extinction on biodiversity is given	All the information regarding the differences between population and species, the description of speciation and the effect of speciation and extinction on biodiversity is given in a logical manner	At least: - **4** correct points for the differences, - **5** for the description of speciation and - **2** for effects of speciation and extinction on biodiversity
Mark	1	1	1

TOTAL SECTION C: 20
GRAND TOTAL: 150