**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

LIFE SCIENCES P2

EXEMPLAR 2014

MEMORANDUM

MARKS: 150

This memorandum 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. 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 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 must be made to the memoranda without consulting the provincial internal moderator 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   A✓✓
        1.1.5   D✓✓
        1.1.6   C✓✓
        1.1.7   D✓✓
        1.1.8   B✓✓
        1.1.9   B✓✓
        1.1.10 B✓✓

                                                        (10 x 2)   **(20)**

1.2   1.2.1   Recessive✓
        1.2.2   Locus✓
        1.2.3   Phenotype✓
        1.2.4   Autosomes✓
        1.2.5   Genetic engineering✓/DNA manipulation/
                  Biotechnology/DNA recombination
        1.2.6   Chromatids✓   (6 x 1)   **(6)**

1.3   1.3.1   Both A and B✓✓
        1.3.2   A only✓✓
        1.3.3   B only✓✓
        1.3.4   A only✓✓
        1.3.5   B only✓✓
        1.3.6   A only✓✓
        1.3.7   None✓✓
        1.3.8   B only✓✓   (8 x 2)   **(16)**

1.4   1.4.1   (a)   RrYy✓   (1)
                (b)   rryy✓   (1)

        1.4.2   RY, Ry, rY, ry✓✓   (2)

        1.4.3   (a)   Wrinkled, yellow✓ seeds   (1)
                (b)   Round, yellow✓ seeds   (1)

        1.4.4   RRYY✓✓   (2)
                                                    (8)
                                                    [50]

QUESTION 2

2.1   2.1.1   (a) DNA✓   (1)
                (b) Ribosome✓   (1)

       2.1.2   (a) G✓   (1)
                (b) U✓   (1)

       2.1.3   – DNA codes for a particular protein✓ but cannot leave nucleus
                – One strand of DNA is used as a template✓
                – to form mRNA✓   (3)

       2.1.4   – According to the codons on mRNA✓
                – tRNA molecules with matching anticodons✓
                – bring the required amino acids to the ribosome✓
                – This is called translation✓
                – The amino acids become attached by peptide bonds✓
                – to form the required protein✓   (any 4)   (4)

       2.1.5   Methionine, ✓ Glycine, ✓ Arginine✓ (in the correct order)   (3)
                                                                                                 (14)

2.2   2.2.1   *H. erectus*✓   (1)

       2.2.2   *A. afarensis*✓   (1)

       2.2.3   (a) 3 mya – 2,4✓ mya = 0,6✓ my✓
                     OR
                     3 mya – 2,3✓ mya = 0,7✓ my✓   (3)

                (b) Fossils✓   (1)

       2.2.4   (a) *H. neanderthalensis*✓   (1)

                (b) *H. neanderthalensis* and *H. sapiens* share a common✓   (2)
                     ancestor✓
                     OR
                     Both evolved✓ from *H heidelbergensis*✓   (2)
                                                                                                 (9)

2.3   2.3.1   – The homologous chromosome pair ✓
                    – does not separate✓/non-disjunction
                    – during anaphase 1✓
                                                                                          (3)

          2.3.2   1✓   (1)

          2.3.3   Down syndrome✓   (1)

          2.3.4   – During crossing over✓
                    – in Prophase 1✓
                    – segments of chromatids of homologous chromosomes✓
                    – are exchanged✓
                    – leading to each gamete having a mix of genetic material from
                       both parents✓   (any 4)

                    – During Metaphase I✓/II
                    – each pair of homologous chromosomes✓/each chromosome
                    – may line up in different ways✓ on the equator of the spindle
                    – allowing the gametes to have different combinations of maternal
                       and paternal chromosomes ✓   (any 3)   (7)
                                                                                          (12)

2.4   2.4.1   Diagram 1✓   (1)

          2.4.2   Diagrams 2 & 3✓✓/ 2 & 4/ 3 & 4   (2)

          2.4.3   Analogous structures show that two organisms evolved
                    independently of each other✓
                    Homologous structures show that two organisms have a common
                    ancestor✓.   (2)
                                                                                          (5)
                                                                                          [40]

QUESTION 3

3.1   3.1.1   (a) Time ✓   (1)

(b) Mortality of mosquitoes ✓   (1)

3.1.2   Mosquito Mortality due to DDT✓/Resistance of mosquitos to DDT
will decrease ✓ over time✓
OR
Mosquito Mortality due to DDT✓/Resistance of mosquitos to DDT
will increase ✓ over time✓
OR
Mosquito Mortality due to DDT✓/Resistance of mosquitos to DDT
will remain the same ✓ over time✓   (3)

3.1.3

Line Graph showing percentage mortality of mosquitoes to DDT over a period of 16 months
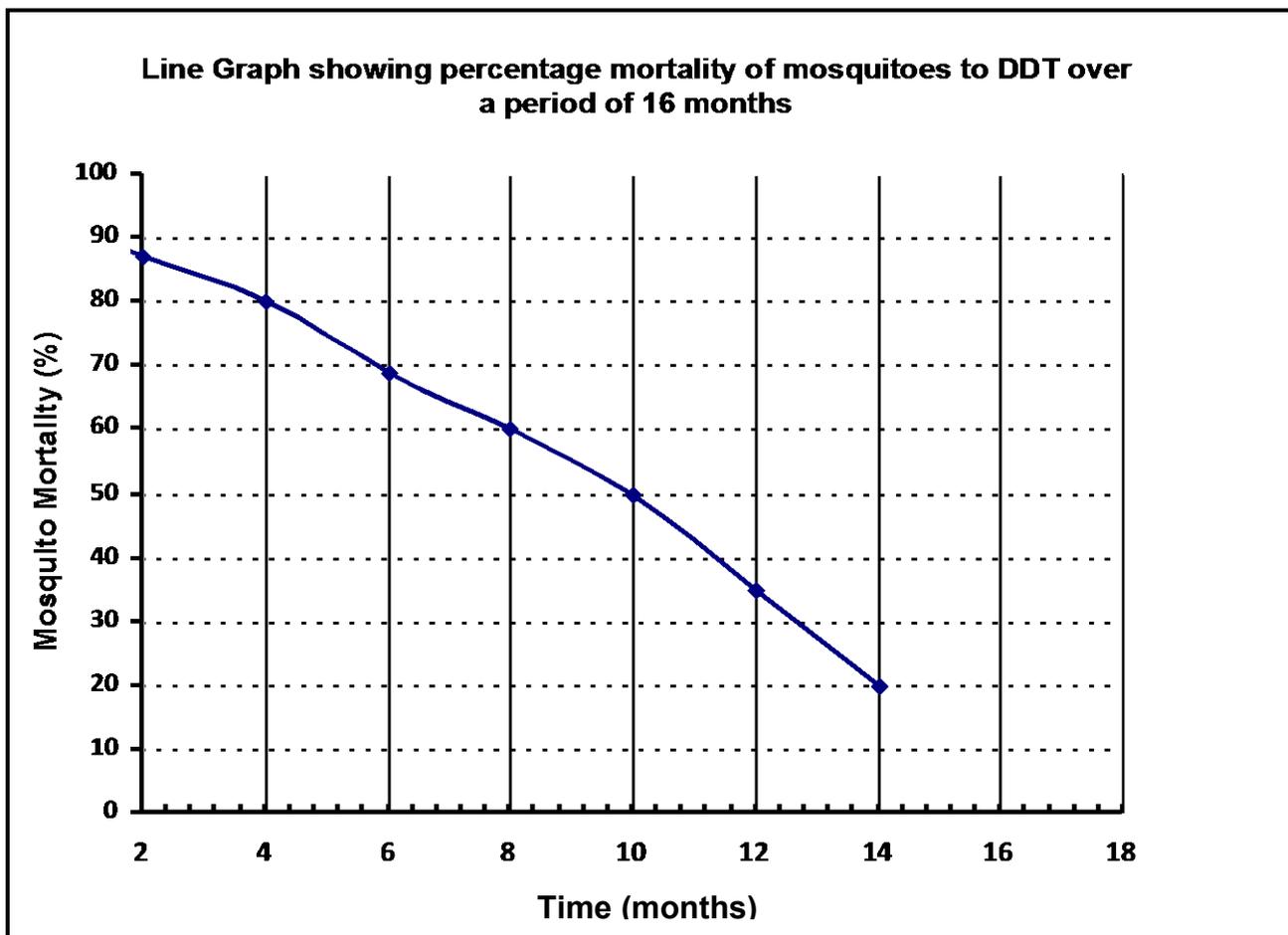
NOTE:

If the wrong type of graph is drawn:
-    Marks will be lost for 'correct type of graph'
If axes are transposed:
-    Marks will be lost for labelling of X-axis and Y-axis

Mark allocation for the graph

Criterion	Elaboration	Mark
Type of graph	Line graph drawn	1
Caption	Includes both variables: 'Percentage mortality of mosquitoes' and 'Time'	1
X-axis	Appropriate scale AND Correct label and units for X-axis: Time (months)	1
Y-axis	Appropriate scale AND Correct label and units for Y-axis: Mortality of mosquitoes (%)	1
Plotting of points	1–8 points plotted correctly – 1 mark All 9 points plotted correctly – 2 marks	2

(6)

3.1.4
- Same species of mosquito✓
- Identical laboratory conditions for the full period of the investigation ✓
- The same scientist must be used for the full period of the investigation ✓
- Mosquitos should not be hurt for the full period of the investigation ✓
  (Mark first TWO only) (any 2)   (2)

3.1.5
- Use a larger sample of mosquitoes✓
- Repeat the investigation✓
- Take many samples each time and calculate the average mortality✓
  (Mark first TWO only) (any 2)   (2)

3.1.6
- More mosquitoes are produced than can survive.✓
- There is genetic variation✓ amongst the mosquitoes.
- Some mosquitoes may be naturally resistant to DDT.✓
- When DDT is applied✓
- those that are resistant survive✓
- and they then reproduce,✓
- passing the allele for resistance to the offspring.✓
- Those that are not resistant, die✓
- and their alleles are lost from the population.✓
- The number of DDT-resistant mosquitoes therefore increases over the generations✓. (any 8)   (8)

(23)

3.2   3.2.1   The oldest fossils of human ancestors✓ were only found in Africa✓   (2)

3.2.2
- Mitochondrial DNA is passed down from mother to child✓
- mutations✓ on the mitochondrial DNA
- were traced to an ancestral female that existed in Africa✓   (3)

(5)

3.3   3.3.1   (a) X^dX^d✓   (2)

                        (b) X^DY✓   (2)

           3.3.2   3✓   (2)

           3.3.3

P_1   phenotype   Normal female   x   Normal male   ✓

        genotype X^DX^d x X^DY ✓

Meiosis

G_1 X^D , X^d x X^D , Y   ✓

Fertilisation

                     X^DX^D, X^DX^d, X^DY, X^dY ✓

F_1   genotype   2 normal females   1 normal   1 colour-   ✓

        phenotype   male   blind male

        Parents and offspring✓/P_1 & F_1

        Meiosis and fertilisation✓   (any 6)

OR

P_1/parent   phenotype   Grey bodied   x   grey bodied✓

             genotype   Gg   x   Gg ✓

Meiosis

Fertilisation

gametes	X^D	X^d
X^D	X^DX^D	X^DX^d
Y	X^DY	X^dY

1 mark for correct gametes✓
1 mark for correct genotypes✓

F_1   genotype   2 normal females   1 normal   1 colour-

        phenotype   male   blind male

        Parents and offspring✓/P_1 & F_1

        Meiosis and fertilisation✓   (any 6)   (6)

                                                         (12)

                                                         [40]

                         TOTAL SECTION B: **80**

SECTION C

QUESTION 4

The development of a new species

- If a population splits into two populations✓.
- There is now no gene flow between the two populations. ✓
- Since each population may be exposed to different environmental conditions✓,
- 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 reproduce with each other✓, thus becoming different species   (any 5)   (5)

The development of bipedalism

- The backward position of the foramen magnum on the skull✓,
- the narrow pelvis✓
- and the less-curved spine✓
- indicates that the ape-like beings were quadripedal✓   (any 3)

- The forward position of the foramen magnum on the skull✓,
- the wider pelvis✓
- and the curved spine✓
- indicates that modern humans are bipedal✓   (any 3)   (6)

Change in the diet from raw food to cooked food

- The large teeth, especially the canines✓
- as well as the large and long jaws✓
- which makes the skull prognathous✓
- as well as cranial/brow ridges associated with large muscles that operate the jaws✓
- indicate that the ape-like beings ate raw food that required a great amount of processing✓/tearing, biting and chewing.   (any 3)

- The smaller teeth, including the canines✓
- as well as the smaller jaw size✓
- which makes the skull less prognathous✓
- as well as the absence of cranial/brow ridges due to the presence of smaller muscles for chewing✓
- indicate that modern humans rely on a diet of cooked food that does not require the same amount of processing✓/tearing, biting and chewing.   (any 3)   (6)

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

ASSESSING THE PRESENTATION OF THE ESSAY

Relevance	Logical sequence	Comprehension
Only information regarding development of a new species, the development of bipedalism and change in diet is given (no irrelevant information).	Generally, the development of a new species, the development of bipedalism and change in diet are explained logically.	All three aspects of the question are described correctly.

TOTAL SECTION C: 20
GRAND TOTAL: 150