Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE

GRADE 12

SEPTEMBER 2016

LIFE SCIENCES P2 MEMORANDUM

MARKS: **150**

This memorandum consists of 12 pages.

PRINCIPLES RELATED TO MARKING LIFE SCIENCES 2016

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 part of it is required.**
   Read all and credit relevant part.

4. **If comparisons are asked for and descriptions are given.**
   Accept if 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 becomes 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 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 provided it does not mean something else in Life Sciences or if it is out of context**.**

13. **If common names given in terminology.**
Accept provided it was accepted at the memo discussion meeting.

14. **If only letter is asked for and only 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 appears 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 marking memoranda without consulting the provincial internal moderator.

SECTION A

QUESTION 1

1.1	1.1.1	B ✓✓		
	1.1.2	D ✓✓		
	1.1.3	C ✓✓		
	1.1.4	C ✓✓		
	1.1.5	B ✓✓		
	1.1.6	D ✓✓		
	1.1.7	A ✓✓		
	1.1.8	D ✓✓		
	1.1.9	A ✓✓		
	1.1.10	C ✓✓		
			(10 x 2)	(20)
1.2	1.2.1	Gene ✓		
	1.2.2	Peptide bond ✓		
	1.2.3	Transcription ✓		
	1.2.4	Centromere ✓		
	1.2.5	Haploid ✓		
	1.2.6	Phenotype ✓		
	1.2.7	Recessive ✓		
	1.2.8	Multiple alleles ✓		
	1.2.9	Evolution ✓	(9 x 1)	(9)
1.3	1.3.1	None ✓✓		
	1.3.2	B only ✓✓		
	1.3.3	Both A and B ✓✓	(3 x 2)	(6)
1.4	1.4.1	10 ✓		(1)
	1.4.2	(a) Dd ✓		(1)
		(b) Dd ✓		(1)
	1.4.3	(a) Homozygous ✓		(1)
		(b) Heterozygous ✓		(1)
	1.4.4	Individual 2 is the grandmother ✓of individual 12.		
		OR		
		Individual 12 is the grandson ✓ of individual 2.		(2)

1.5	1.5.1	DNA Replication ✓	(1)
	1.5.2	- Ensures that daughter cells have the same number of chromosomes as the mother cell. ✓ - Each daughter cell receives genetically identical copies of DNA as the mother cell. ✓	(2)
	1.5.3	(a) Deoxyribose ✓ sugar	(1)
		(b) Phosphate ✓	(1)
		(c) Nucleotide ✓	(1)
		(d) Thymine ✓	(1)
	1.5.4	Mitochondria ✓/ Mitochondrion	(1)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 2.1.1 1 – DNA ✓ template
2 – tRNA ✓
3 – Ribosome ✓ (3)

2.1.2
- The stage of protein synthesis taking place at Z is **Translation** * ✓
- According to the codons of mRNA ✓
- tRNA molecules with complementary anticodons ✓
- bring the required amino acid to the ribosome ✓
- the amino acids link by peptide bonds ✓
- to form the required protein. ✓

(1* Compulsory mark + ANY 4 x 1) (5)

2.1.3 W – Arginine ✓✓
X – Proline ✓✓ (4)

2.2 2.2.1 X^NX^n✓✓

2.2.2

P_1/parent	phenotype	Normal spotted male	x	Normal spotted female✓	
	genotype	$X^N Y$	x	$X^N X^n$ ✓	
	Meiosis				
	G/gametes	X^N , Y	x	X^N ; X^n ✓	
	Fertilisation				
F_1/offspring	genotype	$X^N X^N$; $X^N X^n$; $X^N Y$; $X^n Y$ ✓			
	phenotype	2 Normal spotted females, 1 normal spotted male and 1 dark spotted male ✓			

Parents and offspring ✓/P_1 and F_1
Meiosis and fertilisation ✓ (Any 6 x 1)

OR

P_1/parent phenotype Normal spotted male x Normal spotted female ✓

genotype $X^N Y$ x $X^N X^n$ ✓

Meiosis

G/gametes X^N , Y x X^N ; X^n ✓

Fertilisation

Gametes	X^N	Y
X^N	$X^N X^N$	$X^N Y$
X^n	$X^N X^n$	$X^n Y$

1 mark for correct gametes
1 mark for correct genotypes

F_1/offspring phenotype 2 Normal spotted females, 1 normal spotted male and 1dark spotted male ✓

Parents and offspring ✓/P_1 and F_1
Meiosis and fertilisation ✓ (Any 6 x 1) (6)

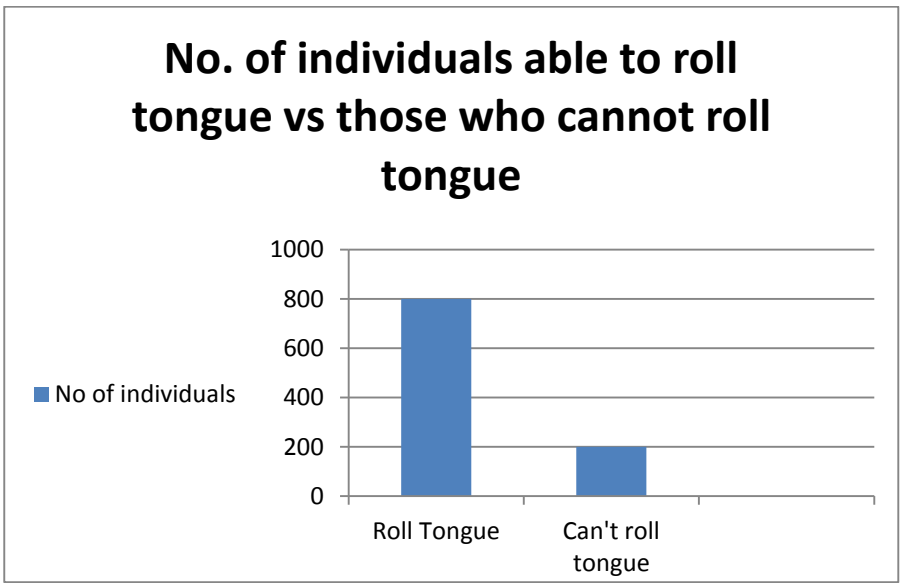
2.2.3 (¼ x 100) ✓= 25% ✓ (2)

2.3 2.3.1 Ability to roll the tongue ✓ (1)

2.3.2
- Ask the permission from the participants and the school principal to conduct the investigation. ✓
- Determine the sample size. ✓
- Decide on how data will be recorded. ✓
- Decide on data capturers to collect data. ✓

(*Mark first THREE only*) (Any 3 x 1) (3)

2.3.3



Mark allocation of the graph

Criterion	Elaboration	Mark
Type of graph (T)	Bar graph drawn	1
Caption (C)	Includes both variables: number of individuals/able or unable to roll tongue	1
X-axis	Equal width of bars AND correct label	1
Y-axis	Appropriate scale AND correct label	
Plotting (P)	1 bar plotted correctly	1
	2 bars plotted correctly	2

NOTE:
If a line graph is drawn –marks will be **awarded** for the 'title and label for X-axis and Y-axis' only.
If a histogram is drawn – marks will be **lost** for the 'type of graph and correct scale' only. (6)

2.3.4 Discontinuous ✓ (1)

2.3.5 There is no range of different phenotypes for tongue rolling ✓/ there are no intermediates between phenotypes, either one can roll their tongue or they cannot. ✓ (2)

2.4 2.4.1 Suspect 2 ✓ (1)

2.4.2 3 of his/her DNA bands match the evidence from the crime scene while none of the other suspects match. ✓ (1)

2.4.3
- Identification of relatives ✓ e.g. paternity suits/tracing siblings separated at birth/identifying unrecognisable bodies of dead people.
- Test for alleles that can cause inherited genetic disorders. ✓
- To determine matching tissues for organ transplants ✓
- Can be used in research into variation in populations ✓

(*Mark first ONE only*) (Any 1 x 1) (1)

2.4.4
- DNA samples may be planted ✓/ person can be framed with the use of false evidence.
- Human error ✓ can lead to false results/ small amount of DNA is analysed therefore not necessarily unique to an individual/ done in private labs so testing standards may not be followed.
- Invasion of privacy ✓/revealing personal information.

(*Mark first TWO only*) (2)

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QUESTION 3

3.1 3.1.1 (a) Metaphase II ✓ (1)

(b) Anaphase II ✓ (1)

3.1.2 Chromatid ✓ (1)

3.1.3 - Chromosomes are arranged singly / randomly along the equator ✓
- Attached to the spindle fibres ✓ (2)

3.1.4 (a) Nondisjunction ✓ (1)

(b) Down syndrome ✓ (1)

(c)
- Mental retardation ✓
- Hearing loss ✓
- Heart defects ✓
- Decreased muscle tone ✓
- Upwardly slanting eyes ✓
- Small mouth ✓
- Abnormal ear shape ✓
- Depressed nasal bridge ✓
- Small nose ✓

(*Mark first ONE only*) (Any 1 x 1) (1)

3.2 3.2.1 Its fur colour allows it to camouflage ✓/blend in with the environment in which it lives. (1)

3.2.2
- There was **variation among the deer mice**. ✓*
- Some had dark fur ✓and others had light coloured fur. ✓
- The light coloured fur was the favourable characteristic ✓ which allowed the mice to blend in with the light coloured sand dunes. ✓
- This helped them to avoid being preyed upon by predators. ✓
- The mice with light coloured fur survived and reproduced. ✓
- This favourable gene for light coloured fur was passed on to their offspring ✓
- This resulted in the future generations having a higher proportion of mice with light coloured fur. ✓

(1* Compulsory mark + Any 5 x 1) (6)

3.3 3.3.1 Geographic speciation ✓/ Speciation (1)

3.3.2
- Original population became separated into two sub-
- populations ✓
- by a geographical barrier ✓
- in this case the **landslide ***✓
- The environmental conditions on each side of the landslide were
- Different ✓
- No gene flow ✓occurred between the two sub-populations
- Each sub-population underwent natural selection independently ✓
- The members of each sub-population became genotypically and
- then phenotypically ✓ different from each other.
- Even if the two sub-populations were to mix ✓
- they would be unable to interbreed ✓/ reproduce
- resulting in the formation two new species.

(1* Compulsory mark + any 5 x 1) (6)

3.3.3 One species has black patches on the body/ears/face while the other one does not have black patches. ✓ (1)

3.4 3.4.1 *Homo heidelbergensis* ✓ (1)

3.4.2 3 ✓ MYA ✓ (2)

3.4.3 According to most scientists, humans originated in Africa ✓and then migrated out of Africa to all parts of the world. ✓ (2)

3.4.4 *Homo erectus* ✓ (1)

3.4.5 *Australopithecus afarensis* ✓ (1)

3.4.6 *Australopithecus africanus* ✓ (1)

3.4.7 (a) Ethiopia ✓ (1)
(b) Donald Johanson ✓/Yves Coppan/Tim White (1)

3.5 3.5.1 A ✓ (1)

3.5.2 Pelvis is long ✓ and narrower ✓in A/not bowl shaped as in B. (2)

3.5.3 B ✓ (1)

3.5.4
- In **B** the pelvis is larger, shorter and **wider/bowl shaped** ✓
- To support the greater weight ✓ due to bipedalism
- and allows females to bear children. ✓ (3)

[40]

TOTAL SECTION B: 80

SECTION C

QUESTION 4

Foramen magnum
- the foramen magnum was in a backward position in African apes ✓
- shift of the foramen magnum to a forward ✓/central position in *Homo species*

Significance
- resulted in a change from quadrupedalism in African apes✓
- to bipedalism ✓in *Homo species* that led to
    - efficient locomotion ✓
    - freeing of hands for using tools ✓/ carry objects / babies/ weapons
    - gaining height for increased awareness ✓ of the surrounding / for sensing danger / locate food / appear intimidating to enemies
    - large surface area of body exposed for thermoregulation ✓/ losing heat to surroundings in hot conditions / reduce overheating
    - display of sex organs ✓/breasts for courtship behaviour

Cranium
- An increase in cranium size ✓ of *Homo species*
- A less sloping forehead ✓
- A more rounded skull ✓

Significance
- created space for a larger brain ✓
- for greater problem solving skills ✓/ processing information faster/ increase in intelligence
- language development✓
- efficient co-ordination of movement✓

Dentition
- decrease in size of canines and incisors ✓/ flatter molars and premolars
- no gaps✓/ diastema between teeth of *Homo species*

Significance
- this signifies the decreased need to bite and tear✓/ increased need to grind and chew
- because the food became softer and cooked✓

Jaws
- C-shaped jaws ✓/ gently curved in *Homo species* compared to the
- U-shaped jaws ✓ in African apes
- jaws became smaller ✓ in humans
- non-prognathous ✓/ less prognathous/ flat face/ less sloping face
- compared to prognathous ✓ / sloping face in African apes

Significance
- allowed consumption of soft and cooked food ✓in *Homo species*
- more developed chin✓
- to assist with speech✓

Eyebrow ridges
- smaller/reduced eyebrow ridges ✓ in *Homo species*

Significance
- due to the decreased need to strengthen skull ✓

Description of features that changed (Any 10 x 1)
Significance of the change described (Any 7 x 1)
Content (17)
Synthesis (3)

ASSESSING THE PRESENTATION OF THE ESSAY

Criterion	Relevance (R)	Logical sequence (L)	Comprehensive (C)
Generally	All information provided is relevant to the topic	Ideas are arranged in a logical / cause-effect sequence	All aspects required by the essay have been sufficiently addressed
In this essay	Information relevant to the description of changes in the skull and their significance are given	Information regarding description of changes in the skull and their significance are given in a logical and sequential manner.	At least **6/10** correct changes in the skull and **4/7** significance of the changes are given.
Mark	1	1	1

TOTAL SECTION C: 20
GRAND TOTAL: 150