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Department:  
Basic Education  
**REPUBLIC OF SOUTH AFRICA**

## **SENIOR CERTIFICATE EXAMINATIONS**

**LIFE SCIENCES P2**

**2016**

**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	D✓✓		
	1.1.3	C✓✓		
	1.1.4	B✓✓		
	1.1.5	A✓✓		
	1.1.6	C✓✓		
	1.1.7	D✓✓		
	1.1.8	C✓✓		
	1.1.9	C✓✓		
	1.1.10	C✓✓	( 10 x 2)	<b>(20)</b>
1.2	1.2.1	Dihybrid✓		
	1.2.2	Biodiversity✓		
	1.2.3	Foramen magnum✓		
	1.2.4	Population✓		
	1.2.5	Hypothesis✓		
	1.2.6	Haemophilia✓		
	1.2.7	Extinction✓		
	1.2.8	Gene✓		
	1.2.9	Bipedalism✓	(9 x 1)	<b>(9)</b>
1.3	1.3.1	Y✓ and Z✓ <b>(Mark first TWO only)</b>		(2)
	1.3.2	Y – Tau✓ Z – Chaka✓		(2)
	1.3.3	I <sup>A</sup> I <sup>A</sup> ✓ I <sup>A</sup> i✓ <b>(Any order)</b>		(2) <b>(6)</b>
1.4	1.4.1	(a) 46✓		(1)
		(b) 44✓		(1)
		(c) 2✓		(1)
	1.4.2	23✓		(1)
	1.4.3	Male✓		(1)
				<b>(5)</b>

1.5	1.5.1	(a) Prophase I✓	(1)
		(b) Metaphase II✓	(1)
	1.5.2	(a) Centriole✓	(1)
		(b) Nuclear membrane✓/(nucleus)	(1)
		(c) Homologous pair✓/Bivalent	(1)
	1.5.3	(a) - Forms spindle✓✓fibres	(2)
		(b) Carries genetic✓/hereditary material	(1)
	1.5.4	Haploid✓	(1)
	1.5.5	Crossing over✓	(1)
			<b>(10)</b>
		<b>TOTAL SECTION A:</b>	<b>50</b>

**SECTION B**

**QUESTION 2**

- 2.1 2.1.1 (a) White✓fur (1)  
 (b) Black✓fur (1)  
 2.1.2 (a) 1✓ and 3✓ (2)  
 (b) 1✓ (1)  
 (Mark first TWO only)  
 (Mark first ONE only)

2.1.3

<b>P<sub>1</sub></b>	Phenotype	Black	X	White✓
	Genotype	BB	X	bb✓
<i>Meiosis</i>				
	<b>G/gametes</b>	B, B	X	b, b✓
<i>Fertilisation</i>				
<b>F<sub>1</sub></b>	Genotype	Bb;	Bb,	Bb;
	Phenotype	All black *0✓%white		
P <sub>1</sub> and F <sub>1</sub> ✓ Meiosis and fertilisation✓				

(\*compulsory mark + 5)

**OR**

<b>P<sub>1</sub></b>	Phenotype	Black	X	White✓									
	Genotype	BB	X	bb✓									
<i>Meiosis</i>													
<i>Fertilisation</i>													
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 5px;">Gametes</td> <td style="padding: 5px;">B</td> <td style="padding: 5px;">B</td> </tr> <tr> <td style="padding: 5px;">b</td> <td style="padding: 5px;">Bb</td> <td style="padding: 5px;">Bb</td> </tr> <tr> <td style="padding: 5px;">b</td> <td style="padding: 5px;">Bb</td> <td style="padding: 5px;">Bb</td> </tr> </table> <p style="margin-top: 5px;">1 mark for correct gametes 1 mark for correct genotypes</p>					Gametes	B	B	b	Bb	Bb	b	Bb	Bb
Gametes	B	B											
b	Bb	Bb											
b	Bb	Bb											
<b>F<sub>1</sub></b>	Phenotype	All black *0✓% white											
P <sub>1</sub> and F <sub>1</sub> ✓ Meiosis and fertilisation✓													

(\* compulsory mark + 5) (6)  
(11)

- 2.2      2.2.1      The two types of shrimp/ type A and B did not belong to the same species✓/ were different species  
**(Mark first ONE only)** (1)
- 2.2.2      -      Individuals that belong to the same species✓ are able to interbreed✓  
-      the two types of shrimps did not mate with each other✓ and therefore were unable to interbreed✓      Any (1 x 2) (2)  
**(Mark first ONE only)**
- 2.2.3      To ensure that the results would be reliable✓ (1)  
**(4)**
- 2.3      -      The original population is separated✓ into two populations  
-      by a **geographical barrier**✓  
-      There is no gene flow✓/no interbreeding between the populations  
-      Each population is exposed to different environmental conditions✓  
-      Natural selection occurred independently✓ in each population  
-      and the individuals of each population became different from each other✓ over time  
-      genotypically and phenotypically✓  
-      Even if the two populations were to mix again✓  
-      they would not be able to reproduce with each other✓      Any (5)

- 2.4 2.4.1 - Ponds 1 and 2 should have identical✓ environmental✓ /  
biological/physical conditions/examples  
- Equal numbers✓ of predatory fish✓ in both ponds (Any 1 x 2) (2)
- 2.4.2 (a) The **type** of predators✓ (1)  
(b) The **number** of spots✓ (1)
- 2.4.3 - As a control✓ /to compare the results between the ponds.  
- To ensure that any changes that occurred✓ were due to the  
- presence of the predator✓ /independent variable (3)
- 2.4.4 - There is variation✓ amongst the male guppies  
- Some have more spots✓  
- while others have fewer spots✓  
- The ones that have more spots attract predators✓  
- and are eaten✓ /killed by predators  
- The ones with fewer spots survived✓ and reproduced  
- to pass the gene for fewer spots on to the next generation✓  
  
Over a period of time, pond 1 with predators had guppies with  
fewer spots Any (5)  
(12)
- 2.5 2.5.1 Phylogenetic tree✓ (1)
- 2.5.2 4✓ (1)
- 2.5.3 (a) *Paranthropus*✓ (1)  
(b) *Ardipithecus*✓ (1)  
(c) *Paranthropus robustus*✓ (1)
- 2.5.4 Mrs Ples✓  
Taung Child✓  
Little Foot✓  
**(Mark first ONE only)** (Any 1) (1)
- 2.5.5 *H. habilis*✓  
*H. erectus*✓  
*H. naledi*✓  
**(Mark first TWO only)** (Any 2) (2)  
(8)  
[40]

**QUESTION 3**

- 3.1 3.1.1 High yield✓  
Short stem✓ (2)
- 3.1.2 hT✓ (1)  
**(Mark first ONE only)**
- 3.1.3 HHtt✓, Hhtt✓ (2)  
**(Mark first TWO only)**
- 3.1.4 Does not break easily in windy conditions✓/to carry a bigger yield/  
easier to harvest Any (1)
- 3.1.5 The plant breeder must cross✓ plants of variety A (HHtt) with  
plants of variety A✓(HHtt) (2)  
**(8)**
- 3.2 **T** ✓

	<b>Lamarckism</b>		<b>Darwinism</b>
1	Variation of the offspring occurs when individuals in the population change✓	1	Variation in the offspring is inherited✓
2	Change occurs because of adaptation to the environment✓/Law of use and disuse/ deterministic theory	2	Natural selection – individuals best suited to the environment survive✓
3	Individuals in the population change✓	3	The population as a whole changes✓
4	Acquired characteristics are inherited by offspring✓	4	Characteristic are passed on from generation to generation to enable individuals to survive in the environment✓

**(Mark first THREE only)****(Any (3 x 2) + 1 for table) (7)**

- 3.3 3.3.1 - Olfactory brain centres reduced✓/ reduced sense of smell  
 - Eyes in front✓/ Binocular vision / stereoscopic vision  
 - Eyes with cones✓/ colour vision  
 - Freely rotating arms✓  
 - Elbow joints allowing rotation of forearm✓  
 - Flat nails instead of claws✓/ bare, sensitive finger tips  
 - Opposable thumbs✓/precision grip  
 - Bipedal✓/ upright posture / foramen magnum in a more forward position  
 - Sexual dimorphism✓/ distinct differences between males and females  
 - Two teats✓  
 - Parts of the brain that process information from the hands and eyes are enlarged✓  
 - Long **upper** arms✓  
 - Large brains✓ / skulls compared to their body mass  
 - Five digits per limb✓ Any (5)
- (Mark first FIVE only)**
- 3.3.2 (a) More curved spine✓/S-shape in humans  
 less curved✓/ C-shaped in apes (2)
- (b) **Short and wide**✓ pelvis in humans  
**long and narrow**✓ pelvis in apes (2)
- 3.3.3 - Canines/teeth have changed from large to small✓✓  
 - This is due to a change from eating raw✓ food  
 - to eating cooked✓food (4)  
**(13)**
- 3.4 3.4.1 2✓ (1)
- 3.4.2 (a) Albino female✓ (1)
- (b) Aa✓✓ (2)
- 3.4.3 (a) 50%✓ (1)
- (b) 25%✓ (1)  
**(6)**
- 3.5 - A gene mutation affects the sequence of nitrogen bases✓/  
 change in the individual nitrogen bases  
 - in DNA✓  
 - This changes transcription✓  
 - Resulting in a changed mRNA✓/codon  
 - which changes the order of the code✓ on the DNA and the RNA/the order  
 of the nitrogen bases  
 - A different amino acid✓ may be coded for  
 - by tRNA✓ leading to the formation of a different protein (Any 6) **(6)**  
**[40]**

**TOTAL SECTION B: 80**

**SECTION C****QUESTION 4****Location, structure and function**

- The DNA is located in the nucleus✓/chromosome/genes/mitochondria
- DNA is a nucleic acid✓
- It has a double✓stranded
- helix✓ configuration
- consisting of building blocks called nucleotides✓  
The three components of a nucleotide are as follows:
- Nitrogenous bases✓
- Phosphate portion✓
- Deoxyribose sugar portion✓(in DNA)
- 4 nitrogenous bases are A,T,C,G✓ of DNA:
- adenine (A) bonds with thymine (T)✓
- cytosine (C) bonds with guanine (G)✓
- by hydrogen bonds✓
- Sections of DNA carry hereditary✓ information
- DNA contains coded information for protein synthesis✓

Max (10)

**Replication✓**

- The double helix unwinds✓
- Double stranded DNA unzips✓
- as the weak hydrogen bonds break✓
- Each original DNA strand serves as a template✓
- Free nucleotides✓build
- a new DNA strand✓onto each of the original DNA strands
- by attaching to their complementary✓nitrogenous bases/(A to T, and C to G)
- this results in two identical✓DNA molecule

Max (7)

Content: (17)

Synthesis: (3)

**(20)****ASSESSING THE PRESENTATION OF THE ESSAY**

Criterion	Relevance (R)	Logical sequence (L)	Comprehensive (C)
<b>Generally</b>	All information provided is relevant to the question.	Ideas are arranged in a logical/cause-effect sequence.	Answered all aspects required by the essay in sufficiently detail.
<b>In this essay in Q4</b>	All the information provided is relevant to the location, structure, functions of DNA and the replication process.  There is no irrelevant information	The information given regarding the location, structure, functions of the DNA and the replication process is arranged in a logical and sequential manner.	At least the following marks should be obtained for: - location, structure and functions of the DNA (7/10) - DNA replication (4/7)
<b>Mark</b>	1	1	1

**TOTAL SECTION C: 20**  
**GRAND TOTAL: 150**