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

## **NATIONAL SENIOR CERTIFICATE**

**GRADE 12**

**LIFE SCIENCES P2**

**FEBRUARY/MARCH 2016**

**MEMORANDUM**

**MARKS: 150**

**This memorandum consists of 9 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 or diagrams are given instead of descriptions**  
Candidates will lose marks.
8. **If sequence is muddled and links do not make sense**  
Where the 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	D✓✓		
	1.1.2	D✓✓		
	1.1.3	C✓✓		
	1.1.4	C✓✓		
	1.1.5	D✓✓		
	1.1.6	B✓✓		
	1.1.7	B✓✓		
	1.1.8	B✓✓		
	1.1.9	D✓✓		
	1.1.10	A✓✓	(10 x 2)	<b>(20)</b>
1.2	1.2.1	Complete dominance✓		
	1.2.2	Cloning✓		
	1.2.3	Population✓		
	1.2.4	Stereoscopic✓/Binocular		
	1.2.5	Hominidae✓/Hominids		
	1.2.6	Down syndrome✓/ trisomy 21		
	1.2.7	Transcription✓		
	1.2.8	Homologous✓		
	1.2.9	Locus✓		
	1.2.10	Discontinuous variation✓	(10 x 1)	<b>(10)</b>
1.3	1.3.1	Both A and B✓✓		
	1.3.2	Both A and B✓✓		
	1.3.3	B only✓✓	(3 x 2)	<b>(6)</b>
1.4	1.4.1	(a) Big✓ and green✓ fruit		(2)
		(b) BG, Bg, bG, bg✓✓		(2)
	1.4.2	0✓ %✓		(2) <b>(6)</b>
1.5	1.5.1	W Cell membrane ✓/ Plasmalemma		(1)
		X Homologous chromosomes✓/Bivalent		(1)
	1.5.2	(a) 4✓		(1)
		(b) 2 ✓		(1)
	1.5.3	D✓		(1)
	1.5.4	Y Holds the sister chromatids together✓		
		Z Pulls chromosomes/chromatids to the poles✓		(2)
	1.5.5	Telophase II✓		(1)
<b>TOTAL SECTION A:</b>				<b>(8)</b> <b>[50]</b>

**SECTION B**

**QUESTION 2**

- 2.1 2.1.1 (11/100) ✓ x 2000 ✓ = 220 ✓ (3)
- 2.1.2 - Repeat ✓ the investigation  
 - Use a larger sample size ✓ / more dogs  
**(Mark first TWO only)** Any 2 (2)
- 2.1.3 The breed of the dogs ✓  
**(Mark first ONE only)** (1)
- 2.1.4 - The disorders are inherited ✓  
 - and therefore does not change with age ✓ (2)
- 2.1.5 Autosomal recessive inheritance causes most of the genetic disorders in dogs ✓ ✓ (2)
- (10)**

2.2. **P<sub>1</sub>** Phenotype Rough hair x Smooth hair ✓  
 Genotype Hh x hh ✓

*Meiosis*

**G/gametes** H h x h h ✓

*Fertilisation*

**F<sub>1</sub>** Genotype Hh Hh hh hh ✓

Phenotypic ratio 1 rough hair : 1 smooth hair ✓

**P<sub>1</sub> and F<sub>1</sub> ✓**  
**Meiosis and fertilisation ✓** Any 6

**OR**

**P<sub>1</sub>** Phenotype Rough hair x Smooth hair ✓  
 Genotype Hh x hh ✓

*Meiosis*

*Fertilisation*

Gametes	H	h
h	Hh	hh
h	Hh	hh

1 mark for correct gametes  
 1 mark for correct genotypes

**F<sub>1</sub>** Phenotypic ratio 1 rough hair : 1 smooth hair ✓

**P<sub>1</sub> and F<sub>1</sub> ✓**  
**Meiosis and fertilisation ✓**

Any 6 **(6)**

- 2.3 2.3.1 (a) DNA✓ (1)
- (b) Ribosome✓ (1)
- 2.3.2 (a) 2✓ (1)
- (b) 5✓ (1)
- (c) 7✓ (1)
- 2.3.3 - The mRNA attaches to the ribosome✓  
 - When each codon✓ of the mRNA  
 - matches with the anticodon ✓ on the tRNA  
 - the tRNA brings the required amino acid to the ribosome✓  
 - When the different amino acids are brought in sequence✓  
 - adjacent amino acids are linked by peptide bonds✓  
 - to form the required protein✓/polypeptide Any 4 (4)
- 2.3.4 (a) CCT✓✓ (2)
- (b) CCU✓✓ (2)
- 2.3.5
- | DNA   | RNA   |
|---|---|
| Has deoxyribose✓ sugar                        | Has ribose✓ sugar                           |
| Has nitrogen base thymine (T)✓/ A, C, G and T | Has nitrogen base uracil(U)✓/ A, C, G and U |
- (Mark first TWO only) (2 x 2) (4)
- TABLE NOT REQUIRED (17)**
- 2.4.1 Embryos✓/Blastocysts  
 Umbilical cord✓/ Placenta  
 Bone marrow✓  
 (Mark first ONE only) Any 1 (1)
- 2.4.2 - Stem cells are undifferentiated ✓  
 - and have the potential to develop into any type of cell✓  
 - to replace the affected/defective cells✓ causing the disorder (3)
- 2.4.3 - To produce ova✓ which could be used  
 - in cases where females do not have functional ovaries✓  
 - and are therefore infertile✓ and thereby  
 - allowing them to have children✓ Any 3 (3)
- (7)  
**[40]**

**QUESTION 3**

- 3.1 3.1.1 - The DNA molecule unwinds✓  
 - Hydrogen bonds between the two strands break✓/ the molecule unzips  
 - Each strand serves as a template✓  
 - Free nucleotides✓ attach to the individual strands  
 - with complementary nitrogen bases✓ pairing  
 - Two identical DNA molecules✓ are formed  
 - Process is controlled by enzymes✓ Any 5 (5)
- 3.1.2 - If the incorrect nitrogen base✓ attaches to the original strand/if a nitrogen base is added or deleted  
 - the sequence✓/order of the bases changes on the new DNA molecule  
 - resulting in a change in the gene structure✓ Any 2 (2)  
**(7)**
- 3.2 3.2.1 'Out of Africa' hypothesis✓ (1)
- 3.2.2 Mitochondrial DNA✓/mtDNA (1)
- 3.2.3 - The mitochondrial DNA is only inherited from the mother✓  
 - Any mutation✓ on this DNA  
 - can be traced✓ along the maternal line only (3)
- 3.2.4 Fossil evidence✓  
 Archaeological evidence✓ Any 1 (1)  
**(Mark first ONE only) (6)**
- 3.3 - A population of a species becomes separated✓ by a geographical barrier  
 - then the population splits into different populations✓  
 - There is no gene flow✓ between the populations  
 - Each population may be exposed to different environmental conditions✓  
 - Natural selection occurs independently✓ in each population  
 - The individuals of each population become 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✓ and are thus different species Any 6 (6)

- 3.4.1 X - Foramen magnum✓ (1)  
Y - Canine✓ (1)
- 3.4.2 - The foramen magnum is located in a more forward position✓below the skull  
- showing that organism C is bipedal✓  
- This allows for the vertebral column/spine to extend vertically✓from the base of the skull  
- to balance the body weight in upright walking✓ Any 3 (3)
- 3.4.3 (a) B✓ (1)  
(b) A✓ (1)
- 3.4.4 - There is an increase✓  
- in the cranium size✓ from organism **B** to organism **C**  
- This will allow it to house a larger brain✓/cerebrum which suggests greater intelligence (3)
- 3.4.5
- | Skull B                           | Skull C                             |
|-----------------------------------|-------------------------------------|
| Brow ridges pronounced✓           | Brow ridges are not as pronounced✓  |
| More protruding jaws✓/larger jaws | Less protruding jaws✓/ smaller jaws |
- (Mark first TWO only) Table1 + (2 x 2) (5)  
**(15)**
- 3.5 3.5.1 - Because they were normal they must each have one dominant allele✓  
- and in order for their children to be affected each parent must have one recessive allele✓ (2)
- 3.5.2 NN✓ or Nn✓ (2)
- 3.5.3 - The father would have been affected✓ if it was sex-linked  
- in order for the daughter to be affected✓ (2)  
**(6)**  
**[40]**

**TOTAL SECTION B: 80**

**SECTION C****QUESTION 4**Lamarckism

- The ancestral elephant stretched its proboscis✓
- to get leaves✓ in trees/further from the body
- The more it used the proboscis✓,
- the longer it became✓
- The offspring then inherited the acquired longer proboscis ✓
- Over many generations the length of the proboscis increased✓
- until it became a trunk✓ as in the modern elephant

Any 5 (5)

Darwinism

- There was a great deal of genetic variation✓ amongst the offspring
- Some had long proboscis✓
- and some had short proboscis✓
- There was a change in environmental conditions✓/competition amongst the animals for food
- They had to reach higher in the trees to get leaves✓
- The animals with shorter proboscis died✓
- Those individuals with the longer proboscis survived✓
- They then reproduced✓
- and passed on this characteristic to their offspring✓
- The next generation of animals had a greater proportion✓ of animals with longer proboscis

Any 9 (9)

Artificial selection

- Humans✓ select the elephants with
- desirable characteristics✓/long trunk
- and mate them to produce offspring with longer trunks✓
- Those that are pure breeding✓ for long trunks
- are further selected to mate to produce offspring with further longer trunks✓

Any 3 (3)  
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	All aspects required by the essay have been sufficiently addressed
<b>In this essay in Q4</b>	Only information relevant to the explanations in terms of Lamarckism, Darwinism and artificial selection are provided	Explanations in terms of Lamarckism, Darwinism and artificial selection are provided in a logical and sequential manner.	At least <b>3</b> correct points for the explanation using Lamarckism, <b>6</b> correct points for the explanation using Darwinism and <b>2</b> correct points using artificial selection
<b>Mark</b>	1	1	1

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