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basic education

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)	**(20)**
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)	**(10)**
1.3	1.3.1	Both A and B✓✓		
	1.3.2	Both A and B✓✓		
	1.3.3	B only✓✓	(3 x 2)	**(6)**
1.4	1.4.1	(a) Big✓ and green✓ fruit		(2)
		(b) BG, Bg, bG, bg✓✓		(2)
	1.4.2	0✓ %✓		(2)
				(6)
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)
			TOTAL SECTION A:	**(8)**
				[50]

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_1 Phenotype: Rough hair x Smooth hair✓
Genotype: Hh x hh✓

Meiosis

G/gametes: H h x h h✓

Fertilisation

F_1 Genotype: Hh Hh hh hh ✓

Phenotypic ratio: 1 rough hair : 1 smooth hair ✓

P_1 and F_1✓
Meiosis and fertilisation✓ Any 6

OR

P_1 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_1 Phenotypic ratio: 1 rough hair : 1 smooth hair ✓

P_1 and F_1✓
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)
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 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 **3** correct points for the explanation using Lamarckism, **6** correct points for the explanation using Darwinism and **2** correct points using artificial selection
Mark	1	1	1

TOTAL SECTION C: 20
GRAND TOTAL: 150