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basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES P2

NOVEMBER 2015

MEMORANDUM 2015

MARKS: 150

This memorandum consists of 12 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	C✓✓		
	1.1.2	D✓✓		
	1.1.3	B✓✓		
	1.1.4	C✓✓		
	1.1.5	A✓✓		
	1.1.6	A✓✓		
	1.1.7	B✓✓		
	1.1.8	D✓✓		
	1.1.9	B✓✓	(9 x 2)	**(18)**
1.2	1.2.1	Homologous✓/homologues/bivalent		
	1.2.2	Alleles✓/Multiple alleles		
	1.2.3	Spindle fibres✓/spindle threads/spindle apparatus		
	1.2.4	Interphase✓		
	1.2.5	Phylogenetic tree✓/cladogram		
	1.2.6	Binocular✓/stereoscopic		
	1.2.7	Dihybrid✓cross		
	1.2.8	Haemophilia✓		
	1.2.9	Biogeography✓	(9 x 1)	**(9)**
1.3	1.3.1	B only✓✓		
	1.3.2	Both A and B ✓✓		
	1.3.3	B only✓✓		
	1.3.4	A only✓✓	(4 x 2)	**(8)**
1.4	1.4.1	(a) B✓		(1)
		(b) B✓		(1)
		(c) A✓		(1)
		(d) A✓		(1)
	1.4.2	Mrs Ples✓ } *A. africanus* Taung Child✓ } Little Foot✓/ *A. prometheus* Karabo✓/ *A. sediba* **(*Mark first TWO only*)**	Any 2	(2)
	1.4.3	Site 4✓		(1)
	1.4.4	Mitochondrial DNA✓/mtDNA/genetic evidence/ Y-chromosome/cultural evidence **(*Mark first ONE only*)**		(1) **(8)**

1.5	1.5.1	(a) 3,1✓ mya✓ (Accept 3,05 to 3,15 mya)		(2)
		(b) *Homo sapiens*✓/*H. sapiens*		(1)
	1.5.2	(a) 500✓ cm^3 (Accept 495 to 505 cm^3)		(1)
		(b) 850✓ cm^3 (Accept 845 to 855 cm^3)		(1)
	1.5.3	Genetic evidence✓/mitochondrial DNA/mtDNA Cultural evidence✓/tool making Comparative anatomy✓ between living hominids **(*Mark first TWO only*)**	Any 2	(2) **(7)**

TOTAL SECTION A: 50

QUESTION 2

2.1 2.1.1
- Conditions/example on the island probably remained the same✓
- so they experienced the same selection pressure✓
- species A was already suited to those conditions✓ Any 2 (2)

2.1.2
- The original species was separated✓ into three/different populations
- **by the sea✓***
- which acted as a geographical barrier✓
- There was no gene flow✓ between the populations
- Each population was 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✓/phenotypically
- Even if the three populations were to mix again✓
- they would not be able to reproduce with each other✓/interbreed 1 *Compulsory mark + Any 5 (6)

(8)

2.2 2.2.1
- The blood groups of the mother, possible father and the child must be compared✓.
- If this shows that it is not possible that these parents can produce a child with his/her blood group✓
- then this man is not the father✓
- If this shows that it is possible that these parents can produce a child with his/her blood group✓
- then he may/may not be the father✓
- because other males have the same blood group✓

Any 5 (5)

2.2.2

P_1	Phenotype	Blood group B	x	Blood group B✓
	Genotype	I^Bi	x	I^Bi✓
Meiosis				
	G/gametes	I^B , i	x	I^B , i ✓
Fertilisation				
F_1	Genotype	$\underbrace{I^BI^B;\ I^Bi;\ I^Bi;}$		$\underbrace{ii}$ ✓
	Phenotype	3 blood group B : 1 blood group O ✓		

P_1 and F_1✓
Meiosis and fertilisation✓

Any 6

OR

P_1	Phenotype	Blood group B	x	Blood group B✓
	Genotype	I^Bi	x	I^Bi✓

Meiosis

Fertilisation

Gametes	I^B	i
I^B	I^BI^B	I^Bi
i	I^Bi	ii

1 mark for correct gametes
1 mark for correct genotypes

F_1 Phenotype 3 blood group B : 1 blood group O ✓

P_1 and
F_1✓
Meiosis and fertilisation✓ (6)

Any 6 **(11)**

2.3 2.3.1 Prophase I✓ (1)

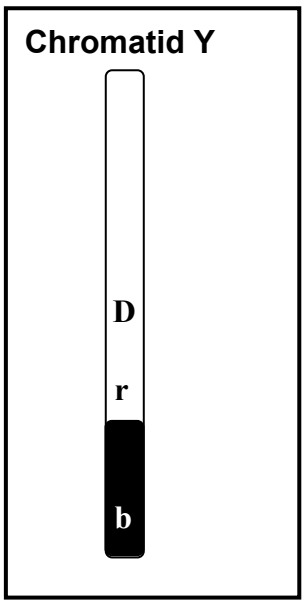
2.3.2
- Homologous chromosomes lie next to each other✓
- Chromatids overlap✓/touch
- at points called chiasmata✓
- and genetic information is exchanged✓/swapped

Any 3 (3)

2.3.3
- Crossing over introduces genetic variation✓ in gametes
- It may lead to new characteristics which are favourable✓
- or new characteristics which are unfavourable✓
- therefore affecting the chances of survival of the organism✓/ natural selection.

Any 2 (2)

2.3.4



ASSESSING THE DIAGRAM	
CRITERIA	**MARKS**
Chromatid Y represented (must be labelled if a whole chromosome is represented)	1
Alleles indicated correctly	1

(2)
(8)

2.4 2.4.1
- Coat is light brown✓ on the upper side
- Dark brown belly✓
- White stripes on the back and mane✓
- Black and white patches on the rest of the body✓
- The tip of the tail is black✓

(Mark first TWO only) Any 2 (2)

2.4.2
- There is variation✓ amongst the Bongo population
- Some have horns that can be laid on their backs✓
- while others do not have horns that can be laid on their backs✓
- The antelope must move through dense vegetation✓ without their horns getting entangled in the vegetation
- Those with horns that cannot be laid on their backs become entangled✓/ die
- Those with horns that can be laid on their backs do not become entangled and escape predators✓/survive
- Those with horns that can be laid back will reproduce✓
- and pass the gene for horns that can be laid on their backs to the next generation✓
- Over many years the proportion of animals that are able to lay their horns on their backs, increases✓

Any 5 (5)
(7)

2.5

2.5.1
- Characteristics that are desirable/beneficial to humans✓ are being selected
- The characteristics are chosen by humans✓/It is an artificial process
- It is not necessarily beneficial for the organism✓

(*Mark first TWO only*) Any 2 (2)

2.5.2
- The long-term effects on health are unknown✓ which could lead to health problems in the future✓
- The long-term effects on the environment are unknown✓ leading to environmental damage✓/loss of biodiversity/ damaging ecosystems/nature
- People are morally opposed✓ as humans are interfering with nature✓/playing God/interfering with the rights of every species
- Initially it is an expensive process✓ and many people/countries may not be able to afford it✓

(*Mark first TWO only*) (Any 2 x 2) (4)
(6)
[40]

QUESTION 3

3.1 3.1.1
- More mistakes are made✓/high rates of mutation
- when RNA is copied✓/than when DNA is copied (2)

3.1.2
- A mutation could allow the virus to be transmitted through the air✓
- This would allow the virus to be spread more easily✓ (2)

(4)

3.2 3.2.1

DNA	RNA
1. Double stranded✓ molecule	1. Single stranded✓ molecule
2. Has a helix✓ shape	2. Is a straight molecule✓
3. One of the nitrogen bases is thymine✓	3. The nitrogen base uracil✓ in place of thymine
4. Contains deoxyribose✓ sugars	4. Contains ribose✓ sugars
5. A longer ✓molecule	5. A shorter✓ molecule
6. Paired bases✓	6. Unpaired bases✓

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

3.2.2 Helps to:
- Solve crimes✓/criminal investigations
- Identify organisms from their tissues✓
- Identify family relationship✓
- Test for specific alleles that can cause a genetic disorder✓
- Establish matching tissues for organ transplants✓
- Used in research into variation in populations ✓

(Mark first TWO only) Any 2 (2)

3.2.3
- Samples containing DNA can be planted✓/person was framed
- Human error✓ during DNA profiling process
- Costly procedure✓
- Invasion of privacy✓

(Mark first TWO only) Any 2 (2)

(11)

3.3 3.3.1 (a) X^AY✓✓ (2)

(b) X^AX^a✓✓ (2)

3.3.2 $\left[\frac{3}{7} \times 100\right]$ ✓ $= 42{,}86$✓/42,9/43% (2)

3.3.3
- An affected female carries two/only recessive alleles✓/X^aX^a
- Sons/males inherit one X chromosome✓ from their mothers
- Sons/males need only one recessive allele to be affected✓
- And therefore must inherit X^a from their mother✓

Any 3 (3)

(9)

3.4 3.4.1 - The meat/egg chickens will grow faster/slower than the egg/meat chickens✓✓

OR

- There will be no difference in the rate of growth of the two types of chicken✓✓ (2)

3.4.2 The type✓/age of chicken. (1)

3.4.3 $\left[\frac{2500 - 500}{500} \times 100\right]$✓ = 400✓% (2)

3.4.4 Increase✓ the reliability✓ (2)

3.4.5
- The same person must weigh the chicks✓ to get accurate results
- The same scale✓ must be used to weigh the chicks
- The chicks must be weighed at the same time of day✓
- Same environmental conditions✓/example
- Same type of food✓
- The same amount of food✓
- The same feeding time✓
- Cages must be the same size✓
- Chickens must be female✓
- Age of the chickens✓
- Same number of chickens in each sample group✓
- ***(Mark first THREE only)*** Any 3 (3)

3.4.6 The chickens that underwent selective breeding for meat production grow faster than chickens bred for egg laying✓✓

OR

The chickens that underwent selective breeding for egg laying grow slower than chickens bred for meat production✓✓

OR

The weight of the chickens increases with age✓✓/time (2)

3.4.7
- Products produced more quickly✓
- Increased resistance to diseases✓
- Improved quality of (chicken) products✓
- Improved yield of (chicken) products✓ Any 2 (2)

3.4.8
- The chickens are larger✓/heavier so they cannot run away from predators✓
- The chickens are larger✓ and is more visible to predators✓
- Decreased variation✓ therefore more susceptible to diseases✓

(Mark first ONE only) Any 1 x 2 (2)

(16)

[40]

TOTAL SECTION B: 80

SECTION C

QUESTION 4

PROTEIN SYNTHESIS

Transcription✓ (T)

- Double stranded DNA unwinds ✓
- and unzips when✓
- the hydrogen bonds break✓
- and this is controlled by enzymes✓
- One strand is used as a template✓
- to form mRNA✓
- using free RNA nucleotides from the nucleoplasm✓
- The mRNA is complementary to the DNA✓
- mRNA now has the coded message for protein synthesis✓

Translation✓ (S)

- mRNA moves from the nucleus✓/to the ribosome
- Each tRNA carries an amino acid✓
- tRNA carries the amino acid to the ribosome✓
- When the anticodon on the tRNA✓
- matches the codon on the mRNA✓
- Amino acids become attached✓ in the sequence determined by the mRNA
- by peptide bonds✓
- to form the required protein✓ Max 13

EFFECTS OF A MUTATION (M)

- A gene mutation affects arrangement/type of the nitrogen bases✓/nucleotides
- This changes the code on the DNA ✓
- which changes the code on the RNA✓
- A different amino acid✓ may be coded for
- which causes a change in the amino acid sequence✓ in the protein
- leading to the formation of a different/alternate/no protein Max 4 (17)

Content: (3)
Synthesis: **(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 description of protein synthesis and the effects of mutation on the process is given	The description of protein synthesis and the effects of mutation on the process given are logical and sequential	At least **5** correct points in the description of transcription and **5** correct points in the description of translation and **2** correct points on the effects of mutation
Mark	1	1	1

TOTAL SECTION C: 20
GRAND TOTAL: 150