basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES P1

EXEMPLAR 2011

MEMORANDUM

MARKS: 150

This memorandum consists of 12 pages.

PRINCIPLES RELATED TO MARKING LIFE SCIENCES 2011

1. **If more information than marks allocated is given**
   Stop marking when maximum marks are 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 parts.

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 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 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 national memo discussion.

14. **If only letter is asked for and only name is given (and vice versa)**
    No 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. No changes must be made to the approved memoranda without consulting the provincial internal moderator, who in turn will consult with the national internal moderator (and the external moderators where necessary).

20. 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 may be used.

SECTION A

QUESTION 1

1.1	1.1.1	C✓✓		
	1.1.2	B✓✓		
	1.1.3	D✓✓		
	1.1.4	A✓✓		
	1.1.5	C✓✓		
	1.1.6	D✓✓		
	1.1.7	C✓✓		
	1.1.8	B✓✓		
	1.1.9	B✓✓		
			(9 x 2)	**(18)**
1.2	1.2.1	Homologous✓		
	1.2.2	Incomplete dominance✓		
	1.2.3	Law of Segregation✓		
	1.2.4	Plasmid✓		
	1.2.5	Genetics✓		
	1.2.6	Haploid ✓	(6 x 1)	**(6)**
1.3	1.3.1	A only✓✓		
	1.3.2	Both A and B✓✓		
	1.3.3	A only✓✓		
	1.3.4	B only ✓✓		
	1.3.5	A only✓✓		
	1.3.6	Both A and B✓✓		
	1.3.7	A only ✓✓		
	1.3.8	B only✓✓	(8 x 2)	**(16)**
1.4	1.4.1	(a) Female✓ black spots✓		(2)
		(b) Male ✓ brown spots✓		(2)
	1.4.2	(a) Bb✓		(1)
		(b) Bb✓		(1)
		(c) bb✓		(1)
	1.4.3	(a) 50%✓		(1)
		(b) 75%✓✓		(2)
				(10)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 2.1.1 The genes for colour-blindness✓ is carried on the sex chromosomes✓ (2)

2.1.2 Recessive✓ (1)

2.1.3 The trait only shows up if it is in the homozygous✓ recessive✓/ not in the heterozygous state. (2)

2.1.4 Thabani has only one X chromosome with a recessive allele ✓ for colour-blindness, the Y chromosome does not carry an allele for the characteristic✓ (2)

2.1.5

		Paul	Sarah
P_1/parent	phenotype	Normal x	Colour-blind✓
	genotype	X^BY x	X^bX^b ✓

Meiosis

G/gametes X^B, Y x X^b✓

Fertilisation

OR

gametes	X^b	X^b
X^B	$X^B X^b$	$X^B X^b$
Y	X^b Y	X^b Y

1 mark for correct gametes
1 mark for correct genotypes

F_1/offspring genotype $X^B X^b$ & X^b Y ✓
phenotype normal daughter and colour-blind son✓

Parents and offspring✓/P_1 and F_1
Meiosis and fertilisation✓

Max (6)
(13)

2.2 2.2.1 Most ✓/fewer learners✓ in the population have the 'hitchhiker's thumb' trait✓
OR
The number of learners✓ that have the 'hitch-hiker's thumb'✓ is the same✓ as the number that have the normal thumb (3)

2.2.2
- Seek permission from participants to collect the data ✓
- Determine the sample size✓
- Determine how to do random sampling✓
- Train data capturers/trial collecting ensuring that all are able to identify the traits correctly✓
- Designing a table to record the data✓ max (4)

2.2.3 Gregor Mendel ✓ (1)

2.2.4
- Repeat the investigation✓
- Do investigation in other populations✓
- Increase the sample size✓ max (2)

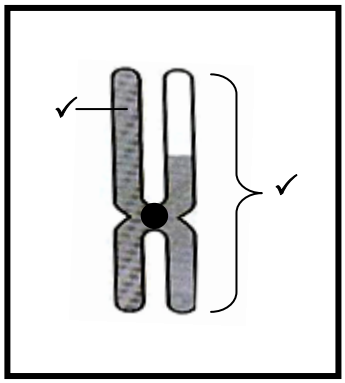
(10)

2.3 2.3.1 B - Centromere✓
C - Chromatid✓
D - Chiasma✓ (3)

2.3.2 Crossing over✓ (1)

2.3.3 Mixing of genetic material introduces variation✓/gametes are different from each other (1)

2.3.4



Mark allocation:
Chromosome drawn✓
Chromosome has shaded and unshaded part in the correct proportion✓

(2)
(7)
[30]

QUESTION 3

3.1 3.1.1 (a) B✓ (1)
(b) A✓ (1)

3.1.2

Diagram A	Diagram B
1 Brow ridges more pronounced✓	1 Brow ridges less pronounced✓
2 Smaller cranium/brain✓	2 Larger cranium/brain✓
3 Jaw protrudes (prognathous)	4 Not prognathous✓
4 No obvious chin✓	5 Pronounced chin✓
5 Elongated cranium✓	3 Shorter cranium✓
6 Zygomatic arch well developed✓	6 Zygomatic arch less developed✓

1 mark for table + (2 x 2) **(5)**

3.1.3 -*H.erectus* was the first *Homo* species ✓to move out of Africa.
-Their large bodies✓ and well adapted pelvic girdles✓ made them better bipedal runners and walkers✓ over long distances than *H.sapiens* Max (3)

3.1.4 -Large brains/skulls compared to their body mass✓
-Olfactory brain centres reduced/reduced sense of smell✓
-Parts of the brain that process information from the hands and eyes are enlarged✓
-Eyes in front/binocular vision/stereoscopic vision✓
-Eyes with cones/colour vision✓
-Freely rotating arms✓
-Long upper arms✓
-Elbow joints allow rotation of forearm✓
-Rotate hands at least 180^0 ✓
-Flat nails instead of claws/bare finger tips✓
-Opposable thumbs which work in opposite direction to their fingers✓
-Upright posture✓
-Sexual dimorphism/distinct differences✓
-Two teats only (Any 4 x 1) (4)
(14)

3.2 3.2.1 7✓ (1)

3.2.2 14✓ (1)

3.2.3 Non-disjunction✓
During meiosis in the wild wheat plant the 7 homologous pairs✓ did not separate✓
The gamete was 2n ✓/ had 14 chromosomes
The same process happened with the natural goat grass✓
Fusion of the two diploid gametes formed a polyploid✓ /tetraploid Emmer max (5)

3.2.4 (a) Polyploidy✓ (1)

(b) The size✓ of the seeds increased and the number✓ of seeds increased from the wild wheat plant to Emmer to the present day wheat (2)

3.2.5 Wind cannot disperse the seeds✓ since the seeds are firmly attached to the husk✓ (2)

3.2.6 Sympatric✓ speciation (1)

3.2.7 Allopatric ✓ speciation (1)

3.2.8 Allopatric speciation: Geographical barrier present ✓
sympatric speciation: No geographical barrier present ✓ (2)
(16)
[30]

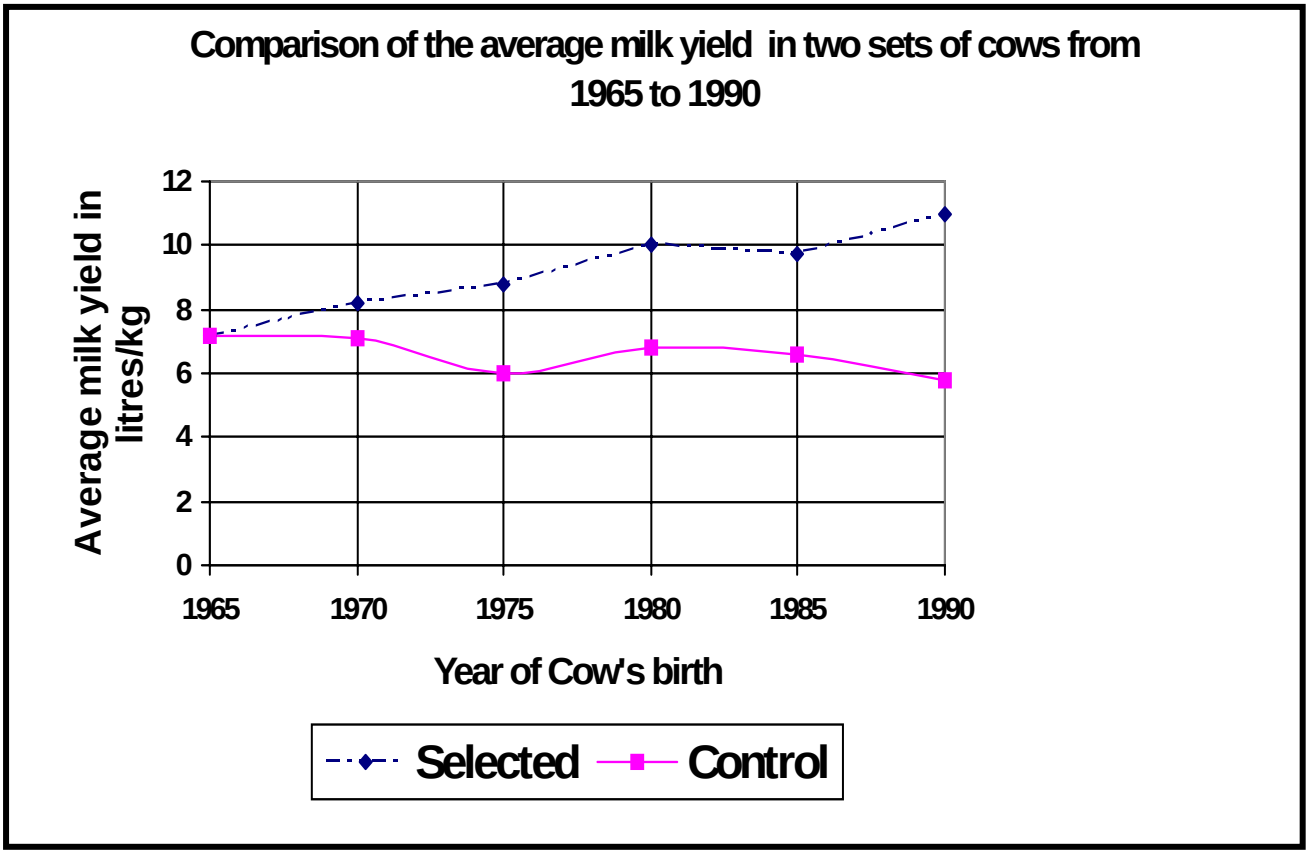
TOTAL SECTION B: 60

SECTION C

QUESTION 4

4.1
- There is a large degree of variation in the bacteria population✓
- When chloramphenicol was first used, it killed off a large number of bacteria✓
- But some bacteria were resistant to chloramphenicol✓ and survived✓
- Those that survived were able to reproduce✓
- Increasing the population of resistant bacteria✓
- Continued use of chloramphenicol had little effect on the resistant bacteria✓
- Hence the disease reappeared✓ max **(5)**

4.2 4.2.1



NOTE:

If the wrong type of graph is drawn:
- Marks will be lost for 'correct type of graph'

If graphs are not drawn on the same system of axes:
- Mark the first graph only using the given criteria

Rubric for the mark allocation of the graph

Correct type of graph	1
Caption for graph	1
Correct label for X-axis	1
Graphs labelled/key provided for 2 graphs	1
Correct label for Y-axis	1
Appropriate scale for X-axis	1
Appropriate scale for Y-axis	1
Drawing of graphs	1 – 1 to 2 points plotted correctly 2 – 3 to 4 points plotted correctly 3 – 5 to 7 points plotted correctly 4 – 8 to 10 points plotted correctly 5 – 11 to 12 points plotted correctly

(12)

4.2.2 11, 0 – 7,2 ✓ = 3,8 ✓ litres/kg ✓ (3)
(15)

4.3 **Possible answer**

The process of protein synthesis occurs in two steps, namely transcription and translation

Transcription✓

- Double stranded DNA unzips ✓
- When the hydrogen bonds break ✓
- One strand is used as a template ✓
- To form mRNA ✓
- Using free RNA nucleotides from the nucleoplasm ✓
- The coded message for protein synthesis is thus copied onto mRNA✓
- mRNA moves from the nucleus to the cytoplasm and attaches to the ribosome ✓ Max (6)

Translation✓

- tRNA collects amino acids ✓
- tRNAs, with amino acids attached, become arranged on the mRNA ✓
- The anticodons on the tRNAs match complementary bases✓ on the codons of mRNA ✓
- Amino acids become attached by peptide bonds to form the required protein✓
- Each tRNA is released to pick up more amino acids✓ Max (6)

Impact of gene mutations on protein synthesis

- Errors✓/mistakes/changes may occur during DNA replication
- Point mutation✓: replacing one base of a codon with another✓
- Small change that may possibly result in one amino acid ✓changing in a protein
- Frameshift mutation✓: addition/deletion of one or more bases of a codon✓
- Resulting in changing the order/sequence of all the bases of the codons ✓
- Resulting in forming a different protein✓ with different functions✓ Max (5)

Content (17)

ASSESSING THE PRESENTATION OF THE ESSAY

Marks	Description
3	Explained all three of transcription, translation or mutation fully without irrelevant information
2	Explained 2 of transcription, translation or mutation fully with little/no irrelevant information
1	Explained 1 of transcription, translation or mutation fully with little/no irrelevant information
0	Not attempted/nothing written other than question number/no correct information

Synthesis (3)
(20)

TOTAL SECTION C: 40
GRAND TOTAL: 150