

# **basic education**

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

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 12**

**LIFE SCIENCES P1  
VERSION 1 (NEW CONTENT) FOR FULL-TIME CANDIDATES**

**NOVEMBER 2011**

**POSSIBLE ANSWERS**

**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 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 part of it is required**  
Read all and credit relevant part.
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 is incorrect, do not credit. If sequence and links becomes correct again, resume credit.
9. **Non-recognized 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. Indicate that the candidate's numbering is wrong.
11. **If language used changes the intended meaning**  
Do not accept.
12. **Spelling errors**  
If recognizable 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 meeting.

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**  
Memorandum will allocate marks for units separately, except where it is already given in the question.
16. **Be sensitive to the sense of an answer, which may be stated in a different way.**
17. **Caption**  
Credit will be given for captions to all illustrations (diagrams, graphs, tables, etc.) except where it is already given in the question.
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 marking memoranda. In exceptional cases, the Provincial Internal Moderator will consult with the National Internal Moderator (and the External Moderators if 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 must be used in the training of markers and in the marking.**

**SECTION A****QUESTION 1**

1.1	1.1.1	B✓✓		
	1.1.2	C✓✓		
	1.1.3	D✓✓		
	1.1.4	C✓✓		
	1.1.5	A✓✓		
	1.1.6	A✓✓		
	1.1.7	D✓✓		
	1.1.8	D✓✓		
	1.1.9	C✓✓		
	1.1.10	C✓✓	(10 x 2)	(20)
1.2	1.2.1	Antibiotic✓		
	1.2.2	Species✓		
	1.2.3	Extinction✓		
	1.2.4	Foramen magnum✓		
	1.2.5	Alleles✓		
	1.2.6	Haploid✓		
	1.2.7	Cloning✓		(7)
1.3	1.3.1	Both A and B ✓✓		
	1.3.2	A only ✓✓		
	1.3.3	None✓✓		
	1.3.4	B only✓✓		
	1.3.5	B only✓✓		
	1.3.6	+✓✓ (any/no answer)		
	1.3.7	Both A and B ✓✓		
	1.3.8	Both A and B ✓✓	(8 x 2)	(16)
1.4	1.4.1	Incomplete✓ dominance		(1)
	1.4.2	(a) RR✓✓/C <sup>R</sup> C <sup>R</sup>		(2)
		(b) RW ✓✓/C <sup>R</sup> C <sup>W</sup>		(2)
		(c) WW✓✓/C <sup>W</sup> C <sup>W</sup>		(2)
				(7)

**TOTAL SECTION A: 50**

**SECTION B**

**QUESTION 2**

2.1 2.1.1

P <sub>1</sub> /parent	<i>phenotype</i>	Father Normal	x	Mother Normal
	<i>genotype</i>	X <sup>H</sup> Y	x	X <sup>H</sup> X <sup>h</sup>
Meiosis				
G/gametes		X <sup>H</sup> , Y	x	X <sup>H</sup> , X <sup>h</sup>
Fertilisation				
F <sub>1</sub> /offspring	<i>genotype</i>	X <sup>H</sup> X <sup>H</sup> , X <sup>H</sup> X <sup>h</sup> , X <sup>H</sup> Y, X <sup>h</sup> Y		
	<i>phenotype</i>	2 normal daughters, 1 normal son, 1 son with haemophilia		

Gametes	X <sup>H</sup>	X <sup>h</sup>
X <sup>H</sup>	X <sup>H</sup> X <sup>H</sup>	X <sup>H</sup> X <sup>h</sup>
Y	X <sup>H</sup> Y	X <sup>h</sup> Y

1 mark for correct gametes  
1 mark for correct genotypes

Max (6)

2.1.2 25% chance / 1 out of 4 / 1/4 (2)

2.1.3 The male has only one X chromosome ✓ Y chromosome does not have the allele for this trait ✓

OR

If he had 'h' he would be a sufferer ✓, therefore he must have had 'H' ✓.

Max (2)  
(10)

2.2      2.2.1      **Disadvantages of genetic engineering**

- Expensive✓
- May be difficult for poor people to access ✓
- Interfere with nature✓
- Immoral✓/ we cannot play God
- Domination of the world food products by only a few companies ✓
- Loss of biodiversity✓
- Potential health impacts✓
- Violation of natural organism's intrinsic value✓(right to independent existence)
- Unsure of long term effects✓
- Genes from transgenic organisms could escape✓and be transferred to wild organisms

**(Mark first THREE only)**

Any 3

(3)

2.2.2      **Advantages of genetic engineering**

- Production of medication✓
- Production of resources cheaply✓
- Control pests with specific genes inserted into the crop✓
- Selecting the best genes to produce better resistant crops✓
- Using specific genes to increase crop yields✓ / food security
- Selecting genes to increase shelf life of plant products✓
- Selecting genes that may increase maturation times✓ to meet the demand
- Selecting genes that may decrease maturation times✓ to meet the demand
- Using specific genes to improve nutritional value✓of food for better health
- Improve the taste✓ of food
- DNA and proteins of transgenic organisms unlikely to cause problems ✓/ transgenic organisms do not survive easily in wild
- Produce organisms that can clean up pollution✓
- Endangered species can be saved✓
- Increases genetic variation✓

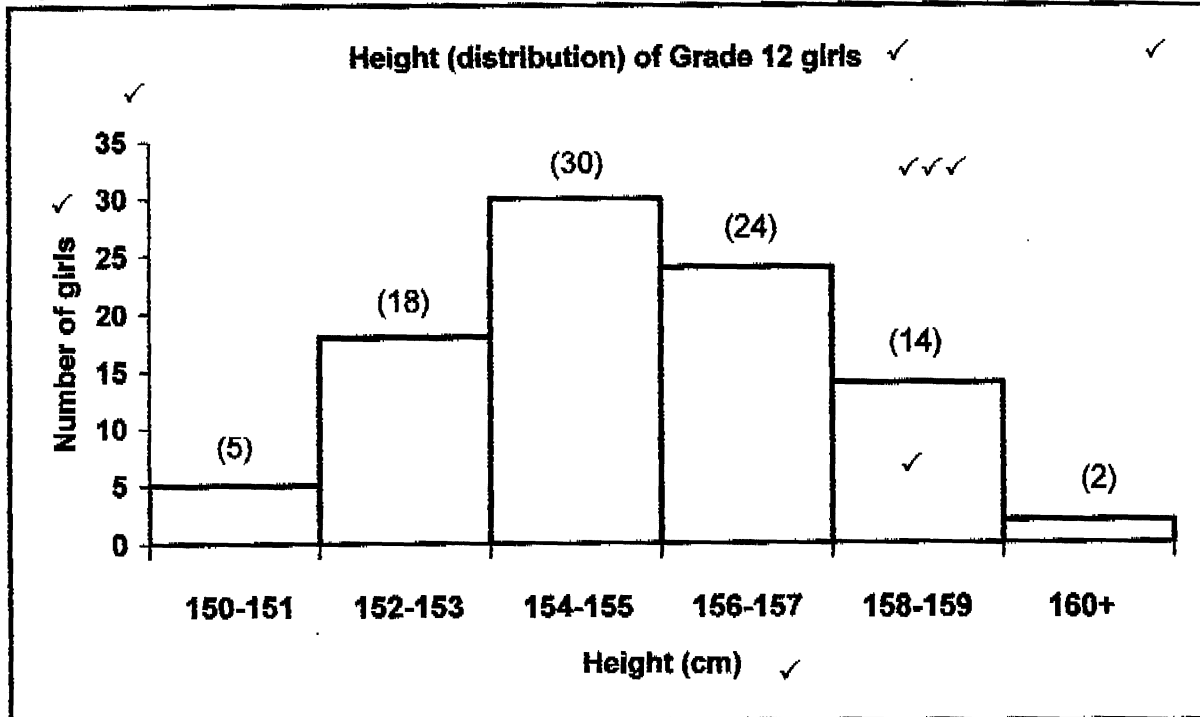
**(Mark first THREE only)**

Any 3

(3)

(6)

2.3 2.3.1



Rubric for the mark allocation of the graph

Correct type of graph	1
Title of graph	1
Correct label and units for X-axis	1
Correct label for Y-axis	1
Appropriate width of bars	1
Appropriate scale for Y-axis	1
Drawing of the bars	1: 1 to 3 bars plotted correctly 2: 4 to 5 bars plotted correctly 3: All 6 bars plotted correctly

(9)

NOTE: If the wrong type of graph is drawn: marks will be lost for

- correct type of graph - 1 mark
- appropriate width of bars - 1 mark (except if a bar graph is drawn)
- drawing of bars - 3 marks

If labels of the axes are transposed then marks will be lost for:

- correct labels for axes - 2 marks
- drawing of bars - 3 marks

2.3.2 Polygenic inheritance✓/polygeny (1)

2.3.3 Polygenic: Genes at different/multiple loci✓  
One gene: Gene at one locus ✓

OR

Polygenic: Has a range of intermediate ✓ phenotypes for the trait/  
continuous variation

One gene: Has distinct ✓ phenotypic traits/discrete/discontinuous  
variation (2)

2.3.4 -Environmental factors ✓/Nutrition

-Sex✓ /Gender

-Age✓

-Medical conditions✓

(Mark first TWO only)

Any 2

(2)

(14)

[30]

**QUESTION 3**

- 3.1 3.1.1 (a) *Pan troglodytes* ✓ /chimpanzee/C  
 (b) *Homo erectus* ✓ /A  
 (c) *Homo sapiens* ✓ /B

OR

- (a) *Homo erectus* ✓ /A  
 (b) *Pan troglodytes* ✓ /chimpanzee/C  
 (c) *Homo sapiens* ✓ /B

(3)

3.1.2

DIAGRAM A/ <i>Homo erectus</i>	DIAGRAM B/ <i>Homo sapiens</i>
1 Small cranium/brain ✓	1 Large cranium/brain ✓
2 Less rounded cranium/skull/flatter forehead ✓	2 More rounded cranium/ skull/ forehead ✓
3 Prognathus ✓ / protruding jaws	3 Not prognathus ✓
4 No obvious chin ✓	4 Pronounced chin ✓
5 Eyebrow ridges visible ✓	5 Eyebrow ridges less visible ✓
6 Eyes face forward ✓	6 Eyes to the side ✓
7 More developed cheekbone/zygomatic arch ✓	7 Less developed cheek bone/ zygomatic arch ✓
8 Bigger lower jaw ✓	8 Slightly smaller lower jaw ✓

**(Mark first THREE only)**

1 mark for table + (3 x 2)

(7)  
(10)

- 3.2
- The oldest fossils ✓ of Australopithecines ✓ /*Homo habilis*/ bipedal have only been found in Africa
  - The oldest fossils ✓ of *Homo erectus* ✓ have been found only in Africa
  - Analysis of mitochondrial DNA ✓ shows that the oldest female ancestors of humans ✓ are from Africa
  - Analysis of Y chromosome ✓ shows that the oldest male ancestors of humans ✓ are from Africa

**(Mark first TWO only)**

Any 2 x 2

(4)

- 3.3 3.3.1 More/fewer ✓ dark peppered moths ✓ / pale peppered moths survive in the polluted /unpolluted environment ✓ than in the unpolluted / polluted environment

OR

No difference ✓ in the number of dark/ pale peppered ✓ moths that survive in both environments ✓

Max

(3)



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NSC -

- 3.3.2 - Was not a closed system so moths could fly in and out of the environment✓/migration may have taken place  
 - The number of predators might have been different in both polluted and unpolluted environment✓  
 - Both environments could have been different with regard to vegetation found in them✓  
 - Both environments could have been different with regard to climatic conditions ✓  
 - Human error in sampling✓/counting/recording/no repeats  
**(Mark first THREE only)** Any 3 (3)
- 3.3.3 - Variation in the moth population produces dark and pale forms✓  
 - The dark moths were camouflaged by black tree trunks✓/not easily detected by birds/predators  
 - More dark moths survived✓/ able to reproduce /fewer eaten by birds  
 - Pale moths were NOT camouflaged by the black tree trunks✓/ easily detected by birds  
 - Fewer pale moths survived✓/fewer able to reproduce/more eaten by birds  
 Max (4)  
 (10)
- 3.4 - There is variation in a population✓  
 - **\*Population occupies the same area✓ / No geographical barrier**  
 - **\*They may separate into different groups/ different niches due to differences in behavioural patterns✓/ feeding habits/ due to polyploidy**  
 - Each group undergoes natural selection independently✓ and develops differently✓  
 - Genotypically✓ and phenotypically✓  
 - Gene flow✓/reproduction between the different populations does not occur  
 - The differences that develop between the different populations prevent them from inter-breeding✓ even if they were to mix  
 - Such that each group becomes a new species✓ (6)  
 Max 4 +2\*(compulsory marks) [30]
- TOTAL SECTION B: 60**

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

4.1	4.1.1	DNA✓		(1)
	4.1.2	1 Phosphate✓ 2 Deoxyribose✓ sugar 3 Thymine ✓/T		(3)
	4.1.3	Nucleotide✓		(1) <b>(5)</b>
4.2	4.2.1	Process by which the DNA of a person/organism is mapped✓/ DNA sequence of an individual is determined/barcode pattern of DNA		(1)
	4.2.2	- Suspect was framed✓ by leaving DNA evidence at the scene✓/swopping specimens at the lab - Human error✓ during DNA profiling process✓ - Suspect had an identical twin✓ who has the same DNA profile✓ - The DNA evidence of the accused was at the scene✓ before✓ the crime was committed <i>(Mark first TWO only)</i>	Any 2 x 2	(4) <b>(5)</b>
4.3	4.3.1	- DNA codes✓ for a particular protein✓/polypeptide/amino acid sequence - One strand is used as a template ✓ - To form mRNA✓ - DNA cannot leave nucleus✓	Any	(4)
	4.3.2	GCC✓ AUA✓ GGA✓ (in sequence)		(3)
	4.3.3	Glycine✓ Proline✓ Serine✓ (in sequence)		(3) <b>(10)</b>

**4.4 Possible answer****Crossing – over ✓**

- Homologous chromosomes ✓ / bivalents pair up
- Each chromosome has 2 chromatids ✓
- Chromatids overlap/cross over ✓
- Points at which crossing-over takes place are referred to as chiasmata ✓
- Genetic material is exchanged ✓ between non-sister chromatids ✓
- After the process of crossing-over chromosomes have genes from its homologous partner ✓
- This means that each gamete formed will have a mix of genes from maternal and paternal parents ✓
- Brings about variation in the gametes ✓ formed and also the offspring **Max (5)**

**Random arrangement of chromosomes at the equator ✓**

- Each pair of homologous chromosomes ✓ may line up either way on the equator of the spindle ✓
- Independently of what the other pairs are doing ✓ / independent assortment
- This means that gametes will have differing number/mix of maternal and paternal chromosomes ✓ **Max (3)**

**Down's syndrome**

- In meiosis I ✓ the chromosome pair 21 does not separate ✓ or
- In meiosis II ✓ the chromatids of chromosome 21 do not separate ✓ / centromere does not divide
- Referred to as non-disjunction ✓
- One gamete will have an extra copy of chromosome number 21 ✓ / two copies of chromosome number 21
- If this gamete fuses with a normal gamete ✓ / gamete with 23 chromosomes
- The resulting zygote will have 3 copies ✓ of chromosome number 21 instead of 2 / zygote has 47 chromosomes leading to Down's syndrome

**Max (4)****Polyploidy**

- During meiosis I ✓
- There is a lack of separation of ALL homologous chromosomes ✓ / non-disjunction
- One gamete will inherit the diploid set of chromosomes ✓
- When a diploid gamete is fertilized by a normal haploid gamete ✓
- The zygote/offspring will have 3 sets of chromosomes ✓ / triploid
- In the similar way, tetraploid and other polyploid offspring could be formed ✓ **Max (3)**

**Advantages of polyploidy in agriculture**

- Forms seedless ✓ varieties of fruit such as watermelons/bananas/some apples
  - Polyploidy cells are bigger ✓ / produce larger flowers/fruits/storage organs
  - Infertile plants become fertile ✓ e.g. wheat
  - Plants may be more healthy ✓ / resistant to diseases **Max (2)**
- Content (17)**

**ASSESSING THE PRESENTATION OF THE ESSAY**

<b>Marks</b>	<b>Descriptions</b>
<b>3</b>	Well structured – demonstrates insight and understanding of question
<b>2</b>	Minor gaps or irrelevant information in the logic and flow of the answer
<b>1</b>	Attempted but with significant gaps and irrelevant information in the logic and flow of the answer
<b>0</b>	Not attempted/nothing written other than question number/ no relevant information

**Synthesis (3)**  
**(20)**

**TOTAL SECTION C: 40**  
**GRAND TOTAL: 150**