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

## **NATIONAL SENIOR CERTIFICATE**

**GRADE 12**

**LIFE SCIENCES P2**

**NOVEMBER 2017**

**MARKING GUIDELINES**

**MARKS: 150**

**These marking guidelines consist of 10 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 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 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 learner's 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. The provincial internal moderator must be consulted, 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	B✓✓		
	1.1.2	D✓✓		
	1.1.3	C✓✓		
	1.1.4	B✓✓		
	1.1.5	C✓✓		
	1.1.6	B✓✓		
	1.1.7	A✓✓		
	1.1.8	C✓✓		
	1.1.9	C✓✓		
	1.1.10	D✓✓	(10 x 2)	<b>(20)</b>
1.2	1.2.1	Uracil✓		
	1.2.2	Biotechnology✓/genetic engineering/genetic manipulation/genetic modification		
	1.2.3	Continuous✓ variation		
	1.2.4	Bipedalism✓/bipedal		
	1.2.5	Deoxyribose✓		
	1.2.6	Haemophilia✓		
	1.2.7	Palaeontology✓		
	1.2.8	Biogeography✓		
	1.2.9	Hominidae✓	(9 x 1)	<b>(9)</b>
1.3	1.3.1	A only✓✓		
	1.3.2	A only✓✓		
	1.3.3	B only✓✓	(3 x 2)	<b>(6)</b>
1.4	1.4.1	(a) Genes✓/alleles		(1)
		(b) Monohybrid✓		(1)
	1.4.2	Ovary✓/gynaecium/pistil/ovule		(1)
	1.4.3	(a) 2✓/Two		(1)
		(b) 4✓/Four		(1)
	1.4.4	(a) Violet✓		(1)
		(b) Short✓		(1)
	1.4.5	2✓/Two		(1)
				<b>(8)</b>
1.5.1	1.5.1	Translation✓		(1)
	1.5.2	(a) Ribosome✓		(1)
		(b) mRNA✓/messenger RNA		(1)
		(c) Peptide✓		(1)
	1.5.3	(a) C✓		(1)
		(b) B✓		(1)
		(c) D✓		(1)
				<b>(7)</b>
<b>TOTAL SECTION A :</b>				<b>[50]</b>

**SECTION B****QUESTION 2**

- 2.1 2.1.1 2✓ (1)
- 2.1.2 CUC✓ (1)
- 2.1.3 (a) TGG✓ (1)  
(b) Aspartate✓ (1)
- 2.1.4 (a) - C was replaced by U✓ on the 4<sup>th</sup> codon✓/AGC  
**OR**  
- AGC✓/the 4<sup>th</sup> codon changed to AGU✓ (2)
- (b) - It codes for the same amino acid✓/serine  
- Therefore there will be no effect✓/same protein formed (2)
- 2.1.5 - The process is **transcription**✓\* **Compulsory mark**  
- The double helix DNA molecule unwinds✓  
- When the hydrogen bonds break✓  
- the DNA molecule unzips✓/2 DNA strands separate  
- One strand is used as the template ✓to form mRNA  
- using free RNA nucleotides✓from the nucleoplasm  
- The mRNA is complementary to DNA✓/A-U, C-G  
- This process is controlled by enzymes✓ 1\* + Any 5 (6)  
**(14)**
- 2.2 2.2.1 - A population is a group of organisms of the same species✓/that  
can interbreed to produce fertile offspring and  
- occupy a given area at a certain time✓ (2)
- 2.2.2 - Crossing over✓  
- Random arrangement✓ of chromosomes } **OR**  
- Random fertilisation✓ } meiosis✓  
- Random mating✓ Any 3 (3)  
**(Mark first THREE only)**
- 2.2.3 - The squirrels with favourable characteristics✓ caused by the  
mutation  
- survive✓/natural selection occurs  
- since they are better suited✓ to the environmental conditions  
- These characteristics are passed on to future generations✓ Any 3 (3)
- 2.2.4 - Since there are now two✓ species/a new species of squirrels  
- the biodiversity has increased✓ (2)
- 2.2.5 - Allow them to interbreed✓/reproduce/mate  
- They will not produce fertile offspring✓/check if they produce  
fertile offspring  
**OR**  
- Conduct DNA tests✓ of both species  
- and compare them✓ (2)  
**(12)**

- 2.3 2.3.1 (a) Colour blind male ✓ / male with Daltonism (1)  
 (b)  $X^D X^d$  ✓ (1)
- 2.3.2 - Linda inherited one recessive allele /  $X^d$  from her father ✓  
 - and one recessive allele /  $X^d$  from her mother ✓ (2)
- 2.3.3 - Males only have one X-chromosome ✓  
 - If this chromosome carries the recessive allele ✓ /  $X^d$   
 - the male will be colour blind ✓  
 - Females have 2 X-chromosomes ✓  
 - They need to have two recessive alleles ✓ /  $X^d X^d$  to be affected  
 - A dominant allele on the other X-chromosome will mask the effect ✓  
 Any 4 (4)

2.3.4

<b>P<sub>1</sub></b>	Phenotype	Normal female	x	Normal male ✓	
	Genotype	$X^D X^d$	x	$X^D Y$ ✓	
<i>Meiosis</i>					
	<b>G/gametes</b>	$X^D, X^d$	x	$X^D, Y$ ✓	
<i>Fertilisation</i>					
<b>F<sub>1</sub></b>	Genotype	$X^D X^D$	$X^D Y$	$X^D X^d$	$X^d Y$ ✓ *
	Phenotype	Normal females, Normal male, Colour blind male			} ✓ *
P <sub>1</sub> and F <sub>1</sub> ✓ Meiosis and fertilisation ✓					

**OR**

<b>P<sub>1</sub></b>	Phenotype	Normal female	X	Normal male ✓									
	Genotype	$X^D X^d$	X	$X^D Y$ ✓									
<i>Meiosis</i>													
<i>Fertilisation</i>													
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="padding: 5px;">Gametes</th> <th style="padding: 5px;"><math>X^D</math></th> <th style="padding: 5px;">Y</th> </tr> <tr> <th style="padding: 5px;"><math>X^D</math></th> <td style="padding: 5px;"><math>X^D X^D</math></td> <td style="padding: 5px;"><math>X^D Y</math></td> </tr> <tr> <th style="padding: 5px;"><math>X^d</math></th> <td style="padding: 5px;"><math>X^D X^d</math></td> <td style="padding: 5px;"><math>X^d Y</math></td> </tr> </table> <p style="margin-top: 5px;">1 mark for correct gametes ✓              1 mark for correct genotypes ✓ *</p>					Gametes	$X^D$	Y	$X^D$	$X^D X^D$	$X^D Y$	$X^d$	$X^D X^d$	$X^d Y$
Gametes	$X^D$	Y											
$X^D$	$X^D X^D$	$X^D Y$											
$X^d$	$X^D X^d$	$X^d Y$											
<b>F<sub>1</sub></b>	Phenotype	Normal females, Normal male, Colour blind male			} ✓ *								
P <sub>1</sub> and F <sub>1</sub> ✓ Meiosis and fertilisation ✓													

(6)  
**(14)**  
**[40]**

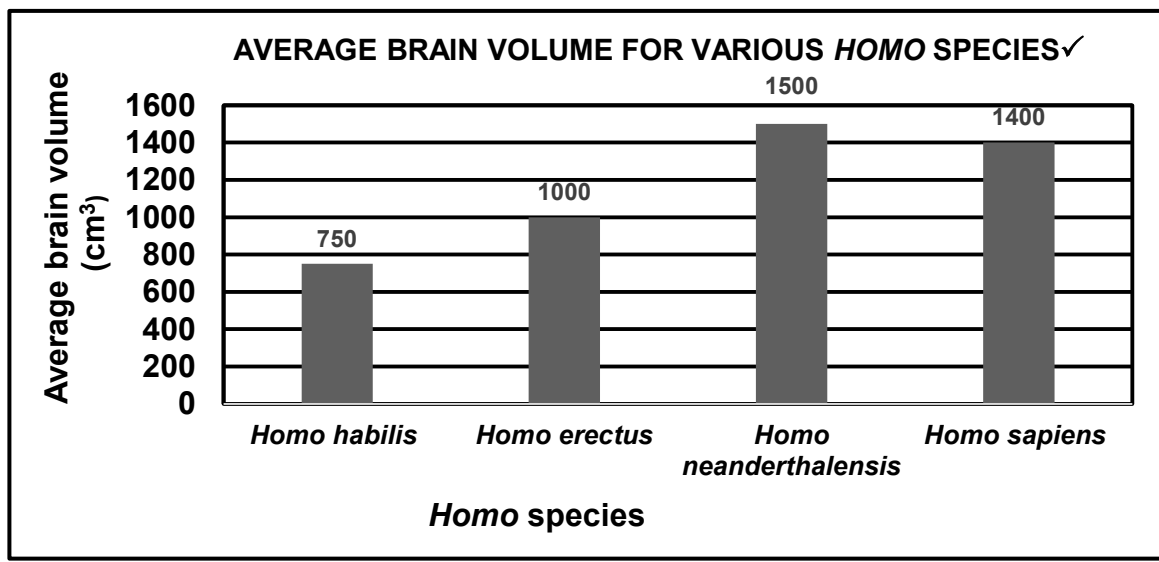
**\*Compulsory 2 + Any 4**



**QUESTION 3**

- 3.1 3.1.1 - Genetic✓/mitochondrial DNA /Y chromosome  
- Cultural✓ (2)  
**(Mark first TWO only)**
- 3.1.2 *Ardipithecus ramidus*✓ (1)  
**(Mark first ONE only)**
- 3.1.3 - They would measure the volume✓  
- of the cranium✓of the fossil (2)
- 3.1.4 (1400 - 500)✓  
= 900✓cm<sup>3</sup> (2)
- 3.1.5 (a) There is an overlap in their period of existence✓/they both  
existed between 2 and 1,6 mya (1)
- (b) - It has the smallest brain volume✓  
- It appeared first✓/is the oldest Any 1 (1)
- 3.1.6

L✓  
S✓  
B✓✓



**Guideline for assessing the graph:**

Bar graph drawn	1
Title of graph includes both variables	1
Correct label for X-axis	1
Correct label and unit for Y-axis (cm <sup>3</sup> ) (L)	1
Equal width and interval of bars	1
Correct scale for Y axis (S)	1
Required bars drawn (B)	1 Only <b>REQUIRED</b> bars drawn
Drawing of bars (B)	1 All 4 <b>REQUIRED</b> bars drawn correctly

(6)  
**(15)**

- 3.2 3.2.1 - Taste✓/sweetness  
- Size✓/largest fruits (2)
- 3.2.2 - Humans✓/villagers  
- select the fruits with desirable characteristics✓/sweetest and largest fruits  
- and scatter✓/grow them/use them to form the next generation of offspring (3)
- 3.2.3 - Climate✓  
- Temperature✓  
- Water✓  
- Soil✓  
- Light✓  
- Humidity✓  
- Gases✓ Any 1 (1)  
**(Mark first ONE only)**
- 3.2.4 - If trees are produced through marcotting there would be no variation within the plantation✓/trees would be genetically identical  
- Any change in the environment/diseases/insects affecting one tree will probably destroy the whole plantation✓ /no other characteristics will be introduced  
**(Mark first ONE only)** (2)
- 3.2.5 - No✓/ the fruits cannot be labelled as genetically modified (GM)  
- because no gene transfer✓/introduction in the marcotting process took place (2)
- 3.2.6 - Production of medication/resources cheaply✓  
- Control pests with specific genes inserted into a crop✓  
- Using specific genes to increase crop yields✓/food security  
- Introduction of genes to improve human health✓  
- Selecting genes to increase shelf-life of plant products✓  
- Improving the quality of the crop✓  
- Allows a faster production time✓  
- Developing resistance to drought✓  
- Developing resistance to pests✓  
- Developing resistance to herbicides✓  
- Developing resistance to diseases✓ Any 2 (2)  
**(Mark first TWO only)** (12)

NSC – Marking Guidelines

- 3.3 3.3.1 - Habitat✓/colour of sand  
- Fur colour✓ (2)  
**(Mark first TWO only)**
- 3.3.2 100✓ (1)
- 3.3.3 - They used a large sample size✓/200 models per habitat/ 200 models per fur colour/ 400 models in total  
- Allowed enough time for predators to attack the models✓  
- Placed mice randomly in each habitat✓ Any 2 (2)  
**(Mark first TWO only)**
- 3.3.4 The darker coloured models were attacked less✓✓ than the lighter coloured models  
**OR**  
The lighter coloured models were attacked more✓✓ than the darker coloured models (2)
- 3.3.5 - More mice/78 models with dark fur colour were attacked✓ in the beach habitat  
- as they were more visible✓/less camouflaged against the light coloured sand  
- Fewer mice with light fur colour/26 models were attacked✓ in the beach habitat  
- as they are less visible✓ /well camouflaged against the light coloured sand (4)
- 3.3.6 - The clay models are not able to escape✓ from predators  
- and therefore they would be attacked more frequently✓  
**OR**  
- The owls will not recognise the models as prey✓and  
- therefore will attack less frequently✓  
**OR**  
-If the models showed signs of an attack✓  
-it doesn't give an indication of their survival ✓ (2)  
**(13)**  
**[40]**

**TOTAL SECTION B: 80**

**SECTION C**  
**QUESTION 4****STRUCTURE AND ARRANGEMENT OF CHROMOSOMES**

- Each chromosome comprises two chromatids✓
- held together by a centromere✓
- There are 23 pairs✓/46 chromosomes in
- human somatic cells✓/body cells
- which are arranged into homologous pairs✓
  - that are similar in length✓
  - carry genes for the same characteristics✓
  - have alleles of a particular gene at the same loci✓ and
  - have the same centromere position✓
- Each somatic cell has 22 pairs/44 autosomes✓ and
- a pair/2 gonosomes✓/sex chromosomes/X and Y chromosomes
- Autosomes are arranged in pairs from largest to smallest✓ in a karyotype
- Males have XY chromosomes✓
- Females have XX chromosomes✓
- The X chromosome is larger than the Y chromosome✓

Max 8 (8)

**BEHAVIOUR OF CHROMOSOMES IN MEIOSIS I**

- During prophase✓ I
- chromosomes pair✓ up/homologous pairs/bivalents form
- Crossing over✓/exchange of genetic material occurs
- between chromatids✓/adjacent chromosome pairs
- During metaphase✓ I of meiosis
- homologous chromosomes✓/chromosome pairs are arranged
- at the equator✓ of the cell
- in a random✓ way
- with the chromosome attached to the spindle fibre✓
- During anaphase✓ I
- chromosome pairs separate✓/chromosomes move to opposite poles
- During telophase✓ I
- the chromosomes reach the poles of the cell✓

Max 9 (9)  
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 sequence.	All aspects of the essay have been sufficiently addressed.
<b>In this essay in Q4</b>	Only information relevant to structure and arrangement of human chromosomes and their behaviour in the different phases of meiosis I is given. No irrelevant information included.	The description of structure and arrangement of human chromosomes and their behaviour in the different phases of meiosis I is given in a logical and sequential manner.	At least the following marks should be obtained - <b>5/8</b> for the structure and arrangement of human chromosome - <b>6/9</b> for behaviour during meiosis I
<b>Mark</b>	1	1	1

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