



# basic education

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

## **NATIONAL SENIOR CERTIFICATE**

**GRADE12**

**LIFE SCIENCES P2**

**NOVEMBER 2014**

**MEMORANDUM**

**MARKS: 150**

**This memorandum consists of 11 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 is incorrect, do not credit. If sequence and links becomes correct again, resume credit.
9. **Non-recognized abbreviations**  
Accept if first defined in the 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 recognizable 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 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. **Changes to the marking memorandum**  
No changes must be made to the marking 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	B✓✓		
	1.1.2	D✓✓		
	1.1.3	C✓✓		
	1.1.4	D✓✓		
	1.1.5	A✓✓		
	1.1.6	C✓✓		
	1.1.7	B✓✓		
	1.1.8	D✓✓		
	1.1.9	A✓✓		
	1.1.10	B✓✓	(10 x 2)	<b>(20)</b>
1.2	1.2.1	Recessive✓		
	1.2.2	Gene✓		
	1.2.3	Cloning✓		
	1.2.4	Genetic engineering✓		
	1.2.5	Artificial selection✓		
	1.2.6	Punctuated equilibrium✓		
	1.2.7	Anaphase I✓		
	1.2.8	Non-disjunction✓		
	1.2.9	Chromosome✓		
	1.2.10	Theory✓		<b>(10)</b>
1.3	1.3.1	Both A and B✓✓		
	1.3.2	A only✓✓		
	1.3.3	Both A and B✓✓		
	1.3.4	Both A and B✓✓		
	1.3.5	A only✓✓		
	1.3.6	A only✓✓	(6 x 2)	<b>(12)</b>
1.4	1.4.1	Two characteristics✓ are involved in the cross		(1)
	1.4.2	(a) ttnn✓		(1)
		(b) TN; Tn; tN; tn✓✓		
			1 – 3 correct ✓	
			all 4 correct ✓✓	(2)
	1.4.3	Taste-blind✓ and normal skin pigmentation✓		(2)
	1.4.4	TTNN✓✓		(2)
				<b>(8)</b>
			<b>TOTAL SECTION A:</b>	<b>50</b>

**QUESTION 2**

- 2.1. 2.1.1 Translation✓ (1)
- 2.1.2 X - tRNA✓/ transfer RNA  
Y - mRNA✓/ messenger RNA (2)
- 2.1.3 Anticodon✓ (1)
- 2.1.4 ATA✓ (1)
- 2.1.5 Tyrosine✓✓ (2)
- 2.1.6 - **The process is transcription**✓\* (1)
- The double stranded DNA molecule unwinds✓/unzips
  - When the hydrogen bonds break✓
  - One strand is used as a template✓
  - to form mRNA ✓
  - Using free nucleotides✓ from the nucleoplasm
  - The mRNA is complementary to the DNA✓/ A-U, C-G
  - This process is controlled by enzymes✓ Any (4)
- \*indicates a compulsory mark 1\*** (5)  
**(12)**
- 2.2 2.2.1 Lindiwe✓ and Bandile✓  
**(Mark first TWO only)** (2)
- 2.2.2 They have DNA bands which correspond✓  
with the banding patterns from both parents✓/ Zinhle and  
Ayanda (2)
- 2.2.3 - To investigate crimes✓/ resolve disputes
- To identify organisms from their remains✓
  - To identify family relationships other than paternity✓, e.g.  
siblings or cousins
  - To test for the presence of specific alleles✓/ genes that  
cause a genetic disorder
  - To establish matching tissues for organ transplants✓
- (Mark first TWO only)** Any 2 (2)  
**(6)**
- 2.3 2.3.1 *Homo habilis*✓ (1)
- 2.3.2 *Paranthropus robustus*✓, *Paranthropus boisei*✓,  
*Homo sapiens*✓ and *Homo habilis*✓  
**(Mark first TWO only)** Any 2 (2)
- 2.3.3 *Australopithecus afarensis*✓ (1)

## CAPS– Memorandum

- 2.3.4
- Olfactory brain centres reduced✓/ reduced sense of smell
  - Eyes in front✓/ Binocular vision / stereoscopic vision
  - Eyes with cones✓/ colour vision
  - Freely rotating arms✓
  - Elbow joints allowing rotation of forearm✓
  - Flat nails instead of claws✓/ bare, sensitive finger tips
  - Opposable thumbs✓
  - Bipedal✓/ upright posture / foramen magnum in a more forward position
  - Sexual dimorphism✓/ distinct differences between males and females
  - Parts of the brain that process information from the hands and eyes are enlarged✓
  - Longer upper arms✓
  - Large brains✓ / skulls compared to their body mass
  - Five digits per limb✓
- (Mark first FIVE only)** Any 5 (5)
- 2.3.5 1- 1,2 my✓/1 000 000 – 1 200 000 years (1)  
**(10)**
- 2.4 2.4.1
- More✓/ fewer
  - long-winged✓/ short-winged flies
  - will survive✓/ die
- OR**
- Equal numbers✓
  - of both types of flies✓
  - will survive✓/ die
- (3)
- 2.4.2
- CO<sub>2</sub> to move out and O<sub>2</sub> to move in✓ / ventilation
  - To allow respiration✓/ breathing
  - So that flies do not die✓/ suffocate
- (3)
- 2.4.3
- Repeat the investigation✓
  - Increase the number of flies✓
  - Using many flasks✓/ replications
- (Mark first TWO only)** Any 2 (2)
- 2.4.4
- Ensure that the flies do not come into contact with the sticky paper✓ when placing them in the flask so that their death will not be caused by the investigator✓
  - Ensure sufficient food supply✓ for the period of the investigation so that death of flies is not due to hunger✓
  - The openings for airflow should be small✓ enough so that the flies cannot escape✓/ or others enter
  - Maintain optimum environmental conditions✓ to allow the flies to survive✓/ behave normally
- (Mark first TWO only)** Any 2 x 2 (4)  
**(12)**  
**[40]**

**QUESTION 3**

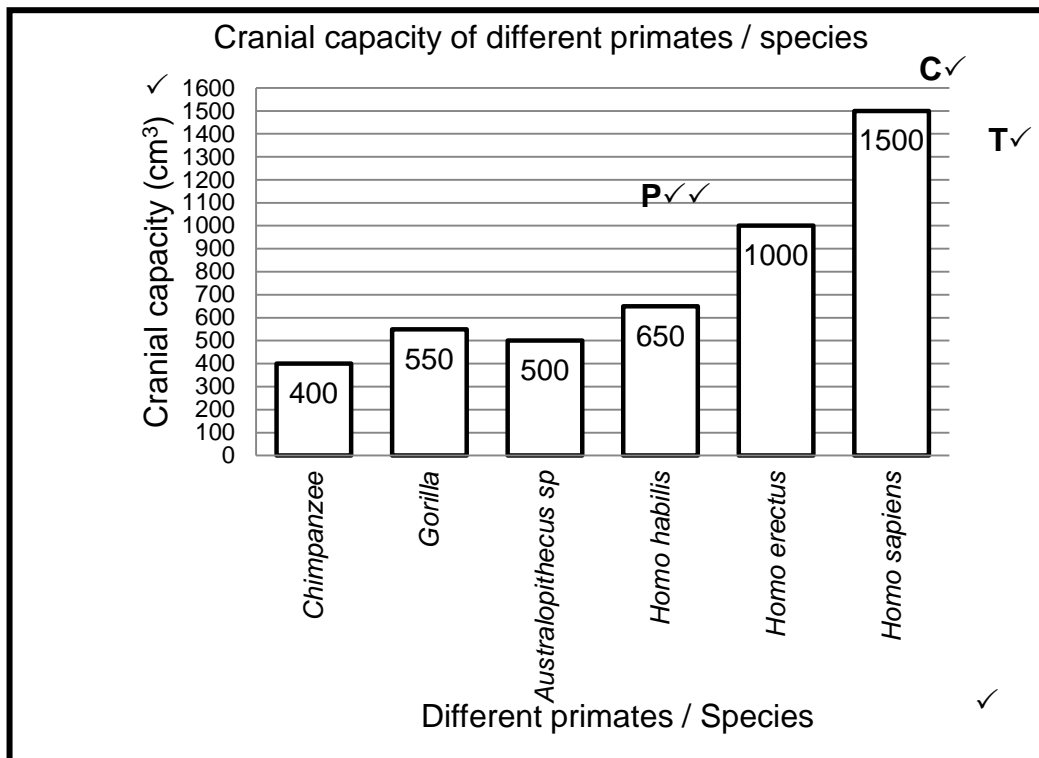
- 3.1 3.1.1 2✓ (1)
- 3.1.2 **A and B** can interbreed and produce fertile offspring, making them **one species**✓
- A** does not mate with **C**, which makes C a **different species**✓/**B** cannot produce fertile offspring with **C**, which makes C a **different species** (2)
- 3.1.3 - **\*Wind blew butterflies to next island**✓ (1)
- Thus separating them geographically✓
  - As the separate islands had different environmental conditions ✓/ have different vegetation/different food for butterflies
  - each group underwent natural selection independently✓
  - and developed differently✓
  - genotypically and phenotypically✓
  - Gene flow/ reproduction between population A / B and C did not occur✓
  - resulting in a new species✓ Any (4)
- \*Compulsory 1 mark** (5)  
(8)
- 3.2 3.2.1 - Provided additional nutrients✓ all year round
- Provided Vitamin D✓
  - Provided calcium✓
- (Mark first ONE only)** Any 1 (1)
- 3.2.2 - Primitive humans / *H. erectus* migrated out of Africa long before✓ the ability to digest milk evolved✓
- They did not have the mutation✓/ enzyme / gene / allele that would allow them to digest cow's milk✓
- Any 1 x 2 (2)
- 3.2.3 Mutations on mitochondrial DNA✓ (1)
- 3.3 3.3.1 B✓ (4)  
(1)
- 3.3.2 - The pelvis is shorter✓compared to its width✓
- OR**
- The pelvis is wider✓ compared to its height✓
- (Mark first ONE only)** (2)

CAPS– Memorandum

- 3.3.3
- Frees the arms✓ so that they could carry offspring✓/ tools / food / manipulate things
  - Allows ability to see further✓ to spot danger✓/ food
  - Exposes a large surface area✓ for thermoregulation✓
  - Reduces the surface area exposed to the sun✓ so less heat is absorbed✓/ less heat lost/thermoregulation
  - Expose the genitals✓to attract opposite sex✓
  - Efficient locomotion✓allows to travel longer distances✓
- (Mark first TWO only)** Any 2 x 2 (4)  
(7)

- 3.4 3.4.1
- Allows for a bigger brain✓
  - Development of speech✓/ communication
  - Higher intelligence✓
  - Complex behaviour✓
  - Quick processing of information✓
  - Process large amounts of information✓
- (Mark first TWO only)** Any 2 (2)

3.4.2



**Mark allocation of the graph**

Criterion	Elaboration	Mark
Type of graph (T)	Bar graph drawn	1
Caption (C)	Includes both variables: 'different primates / species' and 'cranial capacity'	1
X-axis	Equal width of bars AND Correct label (different primates / species and names of species)	1
Y-axis	Appropriate scale AND Correct label and units for Y-axis (cm³)	1
Drawing of bars (P)	1-5 bars plotted correctly – 1 mark All 6 bars plotted correctly – 2 marks	2

(6)

**NOTE: If axes are transposed:**

- Marks will be lost for labelling of 'X-axis 'and 'Y-axis'

**(8)**



- 3.5 3.5.1 (a) Normal female✓ (1)  
 (b)  $X^H X^h$ ✓✓ (2)

- 3.5.2 - Haemophilia is caused by a recessive allele✓  
 - Carried on the X chromosome✓  
 - Females have two X chromosomes✓/ Males only have one X chromosome  
 - Females must inherit two copies of the recessive allele✓/ females who inherit only one of the recessive allele are still normal

Any 3 (3)

3.5.3

**P<sub>1</sub>/P<sub>3</sub>** Phenotype Normal male x Haemophiliac female✓  
 Genotype  $X^H Y$  x  $X^h X^h$ ✓

*Meiosis*

**G/gametes**  $X^H, Y$  x  $X^h, X^h$ ✓

*Fertilisation*

**F<sub>1</sub>/F<sub>3</sub>** Genotype  $X^H X^h; X^H X^h; X^h Y; X^h Y$ ✓  
 Phenotype 2 normal daughters : 2 haemophiliac sons✓  
**\*50%✓ chance of having a haemophiliac son**

P<sub>1</sub> and F<sub>1</sub>✓  
 Meiosis and fertilisation✓

**\*1 compulsory +any 6 (7)**

**OR**

**P<sub>1</sub>/P<sub>3</sub>** Phenotype Normal male x Haemophiliac female ✓  
 Genotype  $X^H Y$  x  $X^h X^h$ ✓

*Meiosis*

*Fertilisation*

Gametes	$X^h$	$X^h$
$X^H$	$X^H X^h$	$X^H X^h$
Y	$X^h Y$	$X^h Y$

1 mark for correct gametes  
 1 mark for correct genotypes

**F<sub>1</sub>/F<sub>3</sub>** Phenotype 2 normal daughters : 2 haemophiliac sons✓  
**\*50%✓ chance of having a haemophiliac son**

P<sub>1</sub> and F<sub>1</sub>✓  
 Meiosis and fertilisation✓

**\*1 compulsory+any 6 (7)**

(13)  
**[40]**  
**80**

**TOTAL SECTION B:**

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

- Crossing over✓
  - occurs during prophase I✓
  - Homologous chromosomes / chromatids overlap✓
  - at points called chiasma✓/ chiasmata
  - Genetic material is exchanged✓
  - resulting in new combinations of genetic material ✓
- Max 3      (3)

- Random arrangement✓of chromosomes
  - occurs during metaphase✓
  - so that they separate in a random✓/ independent manner
  - resulting in new combinations of genetic material✓
- Max 3      (3)

**Mutations**

- A gene✓/ (point and frameshift) mutation occurs
  - as a result of a change in sequence of nitrogen bases✓  
in the DNA molecule
  - A chromosome✓mutation occurs as a
  - result of a change in the structure of a chromosome✓/  
number of chromosomes during meiosis
  - Mutations that occur in sex cells✓
  - are passed on to the new generations✓
  - creating new characteristics✓
- Max 5      (5)

**Role of variation in natural selection**

- Organisms of a particular species shows a great deal of variation✓
  - Some individuals may have characteristics that are favourable✓  
/ any example
  - Others may have characteristics/any example that are unfavourable✓
  - If there is competition/changing environmental conditions✓/  
Selective pressure by the environment
  - organisms with favourable characteristics survive✓
  - and reproduce✓
  - and pass this favourable characteristics to their offspring✓
  - while organisms with unfavourable characteristics will die out✓
  - Over time the whole population will have this favourable trait✓
- Max 6      (6)  
Content:      (17)  
Synthesis:      (3)  
**(20)**

**ASSESSING THE PRESENTATION OF THE ESSAY**

<b>Criterion</b>	<b>Relevance (R)</b>	<b>Logical sequence (L)</b>	<b>Comprehensive (C)</b>
<b>Generally</b>	All information provided is relevant to the topic	Ideas are arranged in a logical sequence for each process	All aspects required by the essay have been sufficiently addressed
<b>In this essay</b>	Only information relevant to the contribution of crossing over, random arrangement of chromosomes, mutation and natural selection is given	Information regarding crossing over, random arrangement of chromosomes, mutation and natural selection arranged in logical way within each aspect	At least <b>three</b> correct points included on <b>each</b> of the three aspects: meiosis, mutations and natural selection
<b>Mark</b>	1	1	1
	R	L	C

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