basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS/ NATIONAL SENIOR CERTIFICATE EXAMINATIONS

LIFE SCIENCES P2

MAY/JUNE 2025

MARKS: 150

TIME: 2½ hours

This question paper consists of 14 pages.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. Answer ALL the questions.
2. Write ALL the answers in the ANSWER BOOK.
3. Start the answers to EACH question at the top of a NEW page.
4. Number the answers correctly according to the numbering system used in this question paper.
5. Present your answers according to the instructions of each question.
6. Do ALL drawings in pencil and label them in blue or black ink.
7. Draw diagrams, tables or flow charts only when asked to do so.
8. The diagrams in this question paper are NOT necessarily drawn to scale.
9. Do NOT use graph paper.
10. You must use a non-programmable calculator, protractor and a compass, where necessary.
11. Write neatly and legibly.

SECTION A

QUESTION 1

1.1 Various options are provided as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question numbers (1.1.1 to 1.1.9) in the ANSWER BOOK, e.g. 1.1.10 D.

1.1.1 Which ONE of the following characteristics do African apes and humans have in common?

A Opposable thumbs
B C-shaped spines
C S-shaped spines
D Short upper arms

1.1.2 Meiosis is a biologically important process because it …

A produces diploid gametes.
B doubles the chromosome number from generation to generation.
C produces genetically identical gametes.
D produces haploid gametes.

1.1.3 The reproductive isolation mechanism characterised by an animal displaying a specific action to attract a mating partner is known as …

A breeding at different times of the year.
B prevention of fertilisation.
C infertile offspring.
D species-specific courtship behaviour.

1.1.4 Which ONE of the following genotypes is homozygous dominant?

A RW
B Rr
C I^BI^B
D ii

1.1.5 How many alleles control blood groups in humans?

A 1
B 2
C 3
D 4

1.1.6 Which ONE of the following is an example of discontinuous variation in humans?

A Blood groups
B Height
C Skin colour
D Hair colour

1.1.7 Which ONE of the following is a CORRECT description of stem cells?

A Specialised cells that divide by mitosis to produce cells that may become further specialised for specific functions
B Unspecialised cells that divide by mitosis to produce cells that may become specialised for specific functions
C Unspecialised cells that divide by meiosis to produce cells that may become specialised for specific functions
D Specialised cells that divide by meiosis to produce cells that may become specialised for specific functions

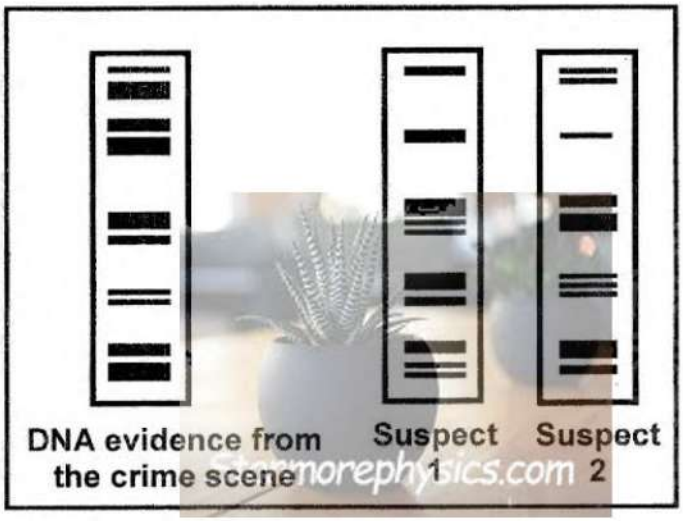
1.1.8 A list of different lines of evidence to support evolution is given below.

(i) Evidence from biogeography
(ii) Fossil evidence
(iii) Genetic evidence
(iv) Cultural evidence

Which ONE of the following options are used as evidence to support human evolution?

A (i), (ii), (iii) and (iv)
B (iv) only
C (ii), (iii) and (iv) only
D (i) only

1.1.9 The police arrested two suspects accused of housebreaking. Their DNA profiles were analysed and compared to the profile of DNA evidence collected from the crime scene.



What conclusion can be drawn from the DNA analysis conducted by the police?

A Suspect **1** is positively linked to the crime.
B Suspect **2** is positively linked to the crime.
C Both suspects are positively linked the crime.
D Neither of the suspects are positively linked to the crime. (9 x 2) **(18)**

1.2 Give the correct **biological term** for EACH of the following descriptions. Write only the term next to the question numbers (1.2.1 to 1.2.10) in the ANSWER BOOK.

1.2.1 Alternative forms of a gene at the same locus

1.2.2 The DNA-containing cell organelle found only in plants

1.2.3 A diagrammatic representation showing the possible evolutionary relationships among different species

1.2.4 An allele that is masked in the phenotype when found in the heterozygous condition

1.2.5 The permanent disappearance of a species from Earth

1.2.6 The deliberate breeding of organisms for desirable characteristics selected by humans

1.2.7 A genetic disorder characterised by the absence of a blood-clotting factor

1.2.8 A group of organisms of the same species in a specific habitat at a particular time

1.2.9 The chromosome pairs 1 to 22 in a human somatic cell

1.2.10 A representation of the number, shape and arrangement of all the chromosomes in the nucleus of a somatic cell (10 x 1) **(10)**

1.3 Indicate whether each of the descriptions in COLUMN I apply to **A ONLY**, **B ONLY**, **BOTH A AND B** or **NONE** of the items in COLUMN II. Write **A only**, **B only**, **both A and B** or **none** next to the question numbers (1.3.1 to 1.3.3) in the ANSWER BOOK.

	COLUMN I	COLUMN II
1.3.1	The DNA-containing material in the nucleus of a non-dividing cell	A: Chromatid B: Chromatin
1.3.2	Location of DNA	A: Nucleus B: Mitochondria
1.3.3	The phase between two consecutive cell divisions	A: Prophase B: Telophase

(3 x 2) **(6)**

1.4 The diagrams below represent two biological processes occurring in the nucleus.

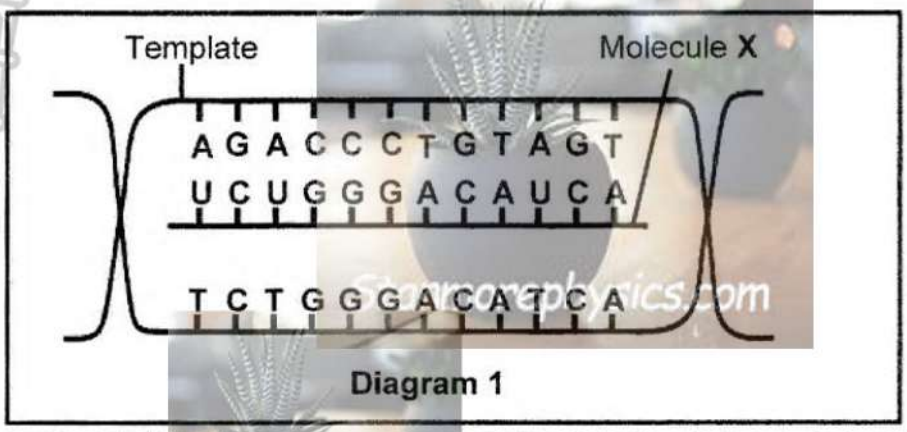


Diagram 1

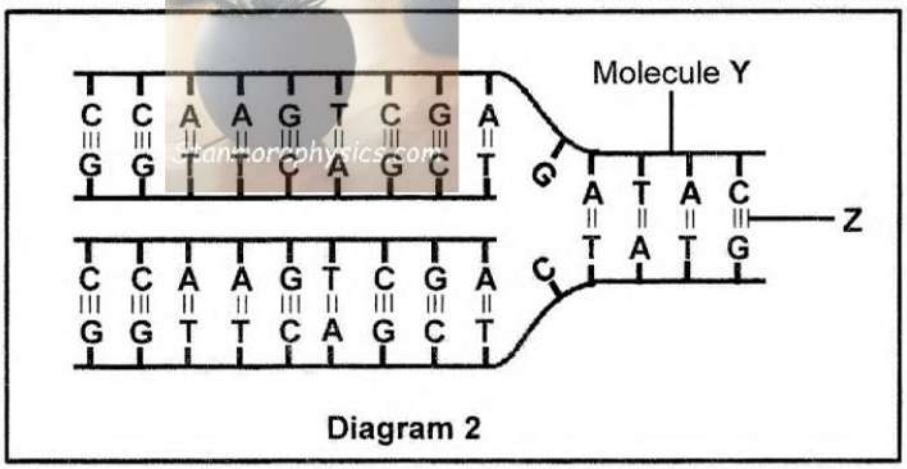


Diagram 2

1.4.1 Name the process represented by:

(a) Diagram **1** (1)

(b) Diagram **2** (1)

1.4.2 Identify molecule **X**. (1)

1.4.3 Give the:

(a) Natural shape of molecule **Y** (1)

(b) Phase of the cell cycle during which the process in Diagram **2** occurs (1)

(c) Full name of the nitrogenous base that is found in molecule **X**, but not in molecule **Y** (1)

1.4.4 Name the:

(a) Sugar found in molecule **X** (1)

(b) Bond **Z** (1)

1.4.5 State the number of codons on molecule **X**. (1)
(9)

1.5 In a plant species, the gene coding for plant height has two alleles. The allele for tall plants (**T**) is dominant over the allele for dwarf plants (**t**). The gene for flower colour has two alleles where the allele for red flower colour (**R**) is dominant over the allele for white flower colour (**r**).

A dwarf, white-flowered plant is crossed with a plant that is homozygous tall and heterozygous for red flower colour.

1.5.1 State the characteristics that are being investigated in this cross. (2)

1.5.2 Give the genotype of the plant that is homozygous tall and heterozygous for red flower colour. (2)

1.5.3 Below is an incomplete Punnett square representing the cross referred to above.

	TR	Tr
tr	**X**	**Y**

Identify the:

(a) Genotype of offspring **X** (1)

(b) Phenotype of offspring **Y** (2)
(7)

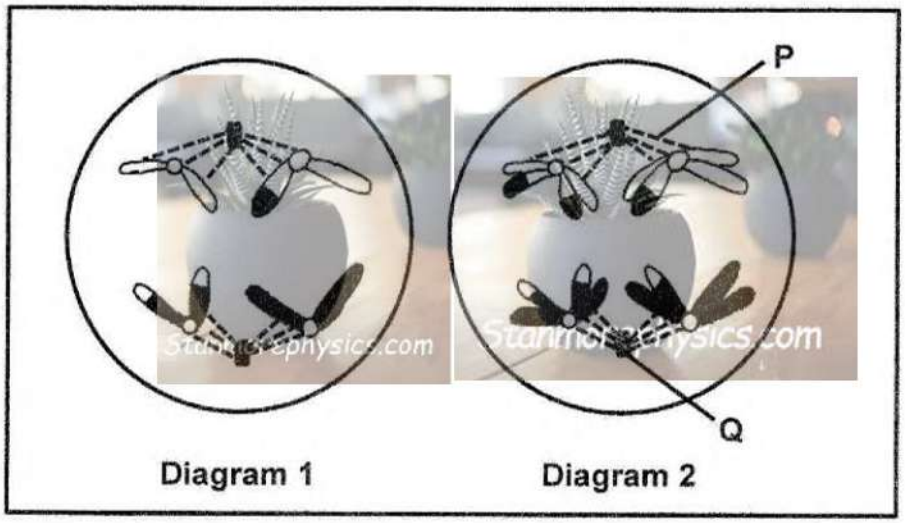
TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 Diagrams **1** and **2** below show two cells of the same organism in different phases of meiosis.

The phases are NOT necessarily shown in the correct order.



2.1.1 State ONE place in the human body where meiosis occurs. (1)

2.1.2 Identify:

(a) Structure **P** (1)

(b) Organelle **Q** (1)

2.1.3 Identify the phase of cell division represented in Diagram **2**. (1)

2.1.4 How many chromosomes will be found in a somatic cell of this organism? (1)

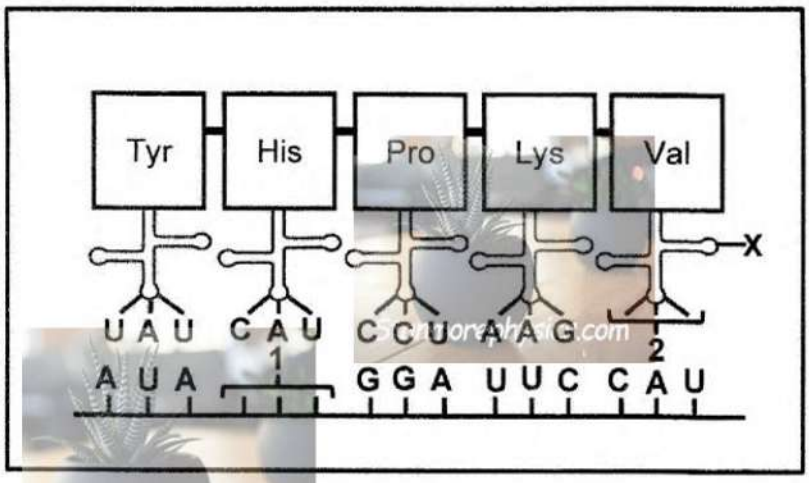
2.1.5 State ONE difference between the processes occurring in Diagram **1** and Diagram **2**. (2)

2.1.6 The chromosomes in the diagram are genetically different due to crossing over.

Describe the process of crossing over. (3)
(10)

2.2 Describe how non-disjunction leads to Down syndrome. **(5)**

2.3 The diagram below represents a stage of protein synthesis.



2.3.1 Name the:

(a) Stage of protein synthesis represented in the diagram (1)

(b) Site where the process named in QUESTION 2.3.1(a) occurs (1)

2.3.2 Describe the role of molecule **X** in protein synthesis. (2)

2.3.3 Identify the complementary bases (from left to right) representing the following:

(a) Anticodon **2** (1)

(b) The DNA triplet for codon **1** (1)

2.3.4 The table below represents the anticodons coding for different amino acids.

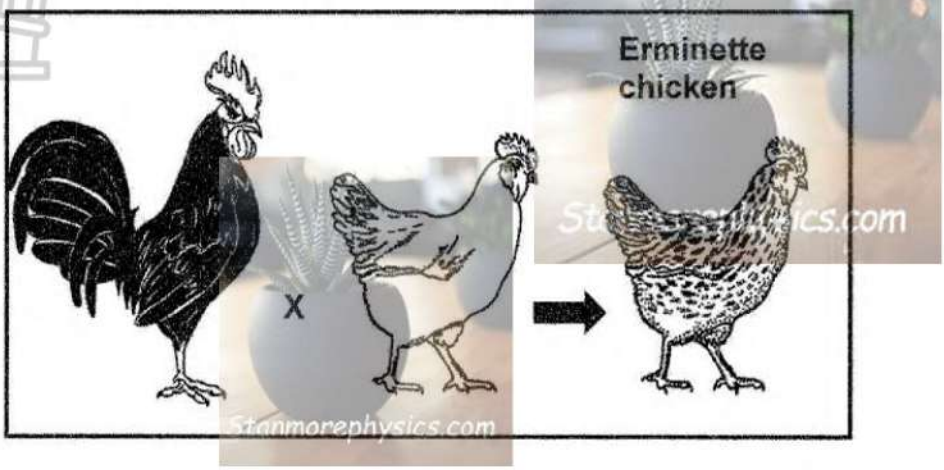
ANTICODON	AMINO ACID
UAU	Tyrosine (Tyr)
CCU	Proline (Pro)
AAG	Lysine (Lys)
GUA	Valine (Val)
CGU	Arginine (Arg)

A mutation occurs during replication. The mutation results in the amino acid proline (Pro) being replaced by arginine (Arg).

Use the table and explain how this mutation will affect the protein that is synthesised. (7)
(13)

2.4 In some chickens, feather colour is controlled by two alleles, white feathers (**W**) and black feathers (**B**).

If a homozygous white chicken is crossed with a homozygous black chicken, the offspring have feathers that are both black and white, a phenotype that is known as erminette, as shown in the diagram below.



2.4.1 Explain why this inheritance is an example of co-dominance. (2)

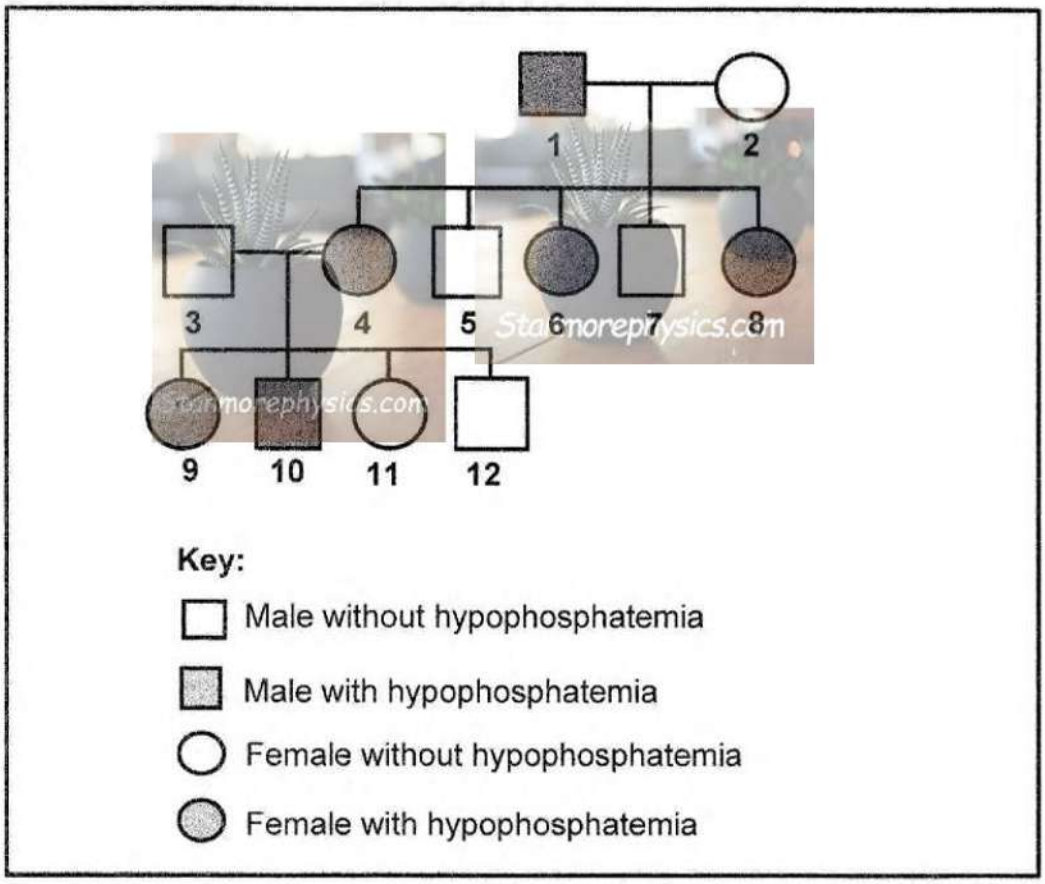
2.4.2 The inheritance of which blood group in humans shows the same type of dominance as explained in QUESTION 2.4.1? (1)

2.4.3 A white chicken is crossed with an erminette chicken.

Use a genetic cross to show ALL the possible phenotypes of the offspring. (6)
(9)

2.5 Hypophosphatemia is a sex-linked inherited condition that is caused by a dominant allele (X^H) on the X chromosome. It results in abnormally low levels of phosphate in the blood which can cause rickets. The recessive allele (X^h) codes for normal phosphate levels.

The pedigree diagram below shows the inheritance of hypophosphatemia in one family.



2.5.1 Name the type of:

(a) Diagram shown (1)

(b) Gonosome found only in males (1)

2.5.2 State TWO effects of hypophosphatemia in humans. (2)

2.5.3 How many individuals in the F_1-generation have hypophosphatemia? (1)

2.5.4 Give ALL the possible genotypes of individual:

(a) **3** (1)

(b) **4** (1)

2.5.5 Explain why ALL the daughters of individuals **1** and **2** will have hypophosphatemia. (6)
(13)
[50]

QUESTION 3

3.1 Cloning is a process during which an identical copy of an organism is produced using biotechnology.

3.1.1 Describe the process of cloning. (5)

3.1.2 List THREE benefits of cloning animals. (3)
(8)

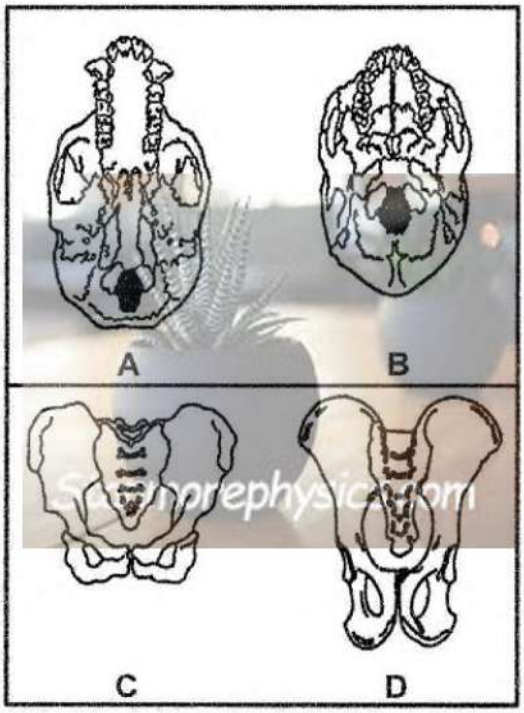
3.2 Read the extract below.

STICKLEBACK FISH

Stickleback fish are small fish found in the ocean and freshwater lakes. The ones in the ocean have spikey fins for protection against predators. Until about 10 000 years ago, most stickleback fish lived in the ocean. But, when the last ice age ended, the melting ice created new lakes and some populations swam into the lakes. The connections between the ocean and the lakes eventually dried up, trapping the stickleback populations in some lakes for thousands of years. Over time, the stickleback fish populations in the lakes lost the spikey fins.

How would Lamarck have explained the absence of spikey fins on stickleback fish in lakes? **(5)**

3.3 The diagrams below represent the skulls and pelvises of a human and a chimpanzee in NO particular order. (The diagrams are drawn to scale.)



3.3.1 Tabulate THREE observable differences between skull **A** and skull **B**. (7)

3.3.2 State why pelvis **C** belongs to a human. (2)
(9)

3.4 The malaria parasite is transmitted to human blood by mosquitoes. People living in malaria-affected areas take antimalarial drugs to prevent infection. If the antimalarial drugs are effective, there should be no parasites in their blood. The presence of parasites, even after treatment, indicates that they have evolved to be drug-resistant.

Researchers wanted to determine if the use of antimalarial drugs caused drug resistance in the malaria parasite.

The procedure was as follows:

- Blood samples were collected from people in affected areas who were taking the drugs.
- The collection of blood samples was done in seven villages in the affected areas.
- The blood samples were kept in the same laboratory and tested for the malaria parasite.
- The number of blood samples having the malaria parasite was counted.
- The investigation was repeated three times in the same seven villages during a year.

In total, 1 485 samples were collected and 551 had the malaria parasite.

3.4.1 How is the malaria parasite transmitted to humans? (1)

3.4.2 State the:

(a) Independent variable (1)

(b) Dependent variable (1)

3.4.3 Calculate the percentage drug resistance in the blood samples taken. Show ALL working and round off your answer to ONE decimal place. (3)

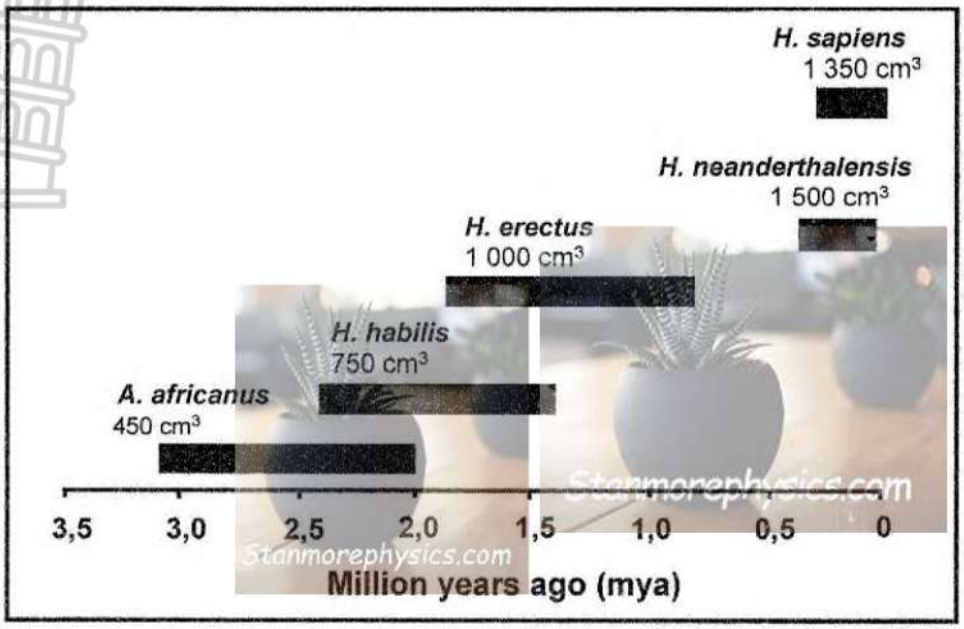
3.4.4 State TWO ways in which the researchers ensured the following:

(a) Validity of the investigation (2)

(b) Reliability of the results (2)

3.4.5 Describe how the malaria parasite developed drug resistance through natural selection. (7)
(17)

3.5 The diagram below shows the evolutionary relationships between different hominids. Their average brain volume is also indicated.



3.5.1 How many genera are shown in the diagram? (1)

3.5.2 When did *A. africanus* become extinct? (1)

3.5.3 Name TWO *A. africanus* fossils found in South Africa. (2)

3.5.4 Using only the species in the diagram, describe the fossil evidence that supports the 'Out-of-Africa' hypothesis. (4)

3.5.5 Explain the influence of brain volume on the complexity of tools made by *H. habilis* and *H. sapiens*. (3)

(11)
[50]

TOTAL SECTION B: 100
GRAND TOTAL: 150

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SENIOR CERTIFICATE EXAMINATIONS/ NATIONAL SENIOR CERTIFICATE EXAMINATIONS

LIFE SCIENCES P2

MAY/JUNE 2025

MARKING GUIDELINES – FINAL 9TH JUNE 2025

DEPARTMENT OF BASIC EDUCATION
PRIVATE BAG X895, PRETORIA 0001
09 -06- 2025
APPROVED MARKING GUIDELINE
PUBLIC EXAMINATION

MARKS: 150

These marking guidelines consist of 9 pages.

HAMIDA MOOSA
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09/06/2025

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PRINCIPLES RELATED TO MARKING LIFE SCIENCES

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 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 non-recognised 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 standardisation 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. The marking guideline 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 marking guideline**
No changes must be made to the marking guidelines. 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 marking guidelines**
Only marking guidelines 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	A✓✓		
	1.1.2	D✓✓		
	1.1.3	D✓✓		
	1.1.4	C✓✓		
	1.1.5	C✓✓		
	1.1.6	A✓✓		
	1.1.7	B✓✓		
	1.1.8	C✓✓		
	1.1.9	D✓✓	(9 x 2)	(18)
1.2	1.2.1	Alleles✓		
	1.2.2	Chloroplast✓		
	1.2.3	Phylogenetic tree✓ /Cladogram		
	1.2.4	Recessive✓ allele		
	1.2.5	Extinction✓		
	1.2.6	Artificial selection✓/Selective breeding		
	1.2.7	Haemophilia✓		
	1.2.8	Population✓		
	1.2.9	Autosomes✓		
	1.2.10	Karyotype✓/karyogram	(10 x 1)	(10)
1.3	1.3.1	B only✓✓		
	1.3.2	Both A and B✓✓		
	1.3.3	None✓✓	(3 x 2)	(6)
1.4	1.4.1	(a) Transcription✓		(1)
		(b) DNA Replication✓		(1)
	1.4.2	mRNA✓		(1)
	1.4.3	(a) Double helix✓		(1)
		(b) Interphase✓		(1)
		(c) Uracil✓		(1)
	1.4.4	(a) Ribose✓sugar		(1)
		(b) Hydrogen✓bond		(1)
	1.4.5	4✓/Four		(1)
				(9)
	1.5.1	Plant height✓		(2)
		Flower colour✓		(2)
	1.5.2	TTRr✓✓		(1)
	1.5.3	(a) TtRr✓		(2)
		(b) Tall plant, white flower✓✓		(7)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 2.1.1
- Ovaries✓
- Testes✓

Any (1)

(Mark first ONE only)

2.1.2 (a) Spindle fibre✓ (1)

(b) Centriole✓ /centrosome (1)

2.1.3 Anaphase I✓ (1)

2.1.4 4✓/four (1)

2.1.5
- In diagram 1 the centromeres split✓
- In diagram 2 the centromeres do not split✓

OR

- In diagram 1 only chromatids (daughter chromosomes) move to the opposite poles✓ /chromosomes separate
- In diagram 2 chromosomes move to the opposite poles✓ /(homologous) chromosome pairs separate

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

2.1.6
- Adjacent (non-sister) chromatids of homologous chromosomes overlap✓
- at points called chiasmata✓ /chiasma
- There is an exchange of genetic material✓

(3)
(10)

2.2
- Failure of a homologous pair 21 /chromosome 21 to separate✓
- during Anaphase✓I /II
- leads to a gamete with 24 chromosomes✓ / an extra chromosome
- The fertilisation of this gamete with a normal gamete✓ /with 23 chromosomes
- results in a zygote with 47 chromosomes✓ /an extra chromosome /Trisomy 21

(5)

2.3 2.3.1 (a) Translation✓ (1)

(b) Ribosome✓ (1)

2.3.2
- Transfers amino acids✓ to the ribosome
- according to the (mRNA) codon✓

(2)

2.3.3 (a) GUA✓ (1)

(b) CAT✓ (1)

2.3.4
- The sequence of bases on a DNA molecule changes✓
- from CCT to CGT✓ /second base in DNA triplet changed from C to G
- The codon GGA changed to GCA✓
- The tRNA molecule with the anticodon CCU✓
- is now replaced by a tRNA molecule with the anticodon CGU✓
- The sequence of amino acids changes✓ and
- a different protein is formed✓

(7)
(13)

2.4 2.4.1 - Both alleles for black feathers and white feathers✓
- are equally dominant✓ /expressed in the phenotype of the erminette chicken (2)

2.4.2 (Blood group) AB✓ (1)

2.4.3

P_1	Phenotype	White	x	Erminette✓
	Genotype	WW	x	BW✓
Meiosis				
	G/gametes	W, W	x	B, W✓
Fertilisation				
F_1	Genotype	BW , WW , BW , WW✓		
	Phenotype	Erminette, white✓*		

P_1 and F_1✓
Meiosis and fertilisation✓

*1 compulsory mark + any 5

OR

P_1	Phenotype	White	x	Erminette✓
	Genotype	WW	x	BW✓

Meiosis

Fertilisation

Gametes	W	W
B	BW	BW
W	WW	WW

1 mark for correct gametes
1 mark for correct genotypes

F_1 Phenotype Erminette, white✓*

P_1 and F_1✓
Meiosis and fertilisation✓

*1 compulsory mark + Any 5 (6)
(9)

2.5 2.5.1 (a) Pedigree✓diagram (1)

(b) Y✓chromosome (1)

2.5.2 - Low levels of phosphate✓
- can cause rickets✓
(Mark first TWO only) (2)

2.5.3 3✓/Three (1)

2.5.4 (a) X^hY✓ (1)

(b) X^HX^h✓ (1)

2.5.5 - Individual 1 is a male with hypophosphatemia✓
- and has the genotype X^HY✓
- The daughters inherit the dominant allele/X^H from their father✓
- Individual 2 is a female who does not have hypophosphatemia✓
- and has the genotype X^hX^h✓
- The daughters inherit one recessive allele/X^h from their mother✓
- The X^h from the mother/individual 2 is masked by the X^H from the father✓/ all daughters will have X^HX^h genotype Any (6)

(13)
[50]

QUESTION 3

3.1 3.1.1 Animals:

- The nucleus is removed from an ovum✓
- The nucleus of a donor somatic cell is removed✓
- and inserted into the ovum✓
- Electric shock is used to activate mitosis✓
- An embryo develops✓
- and is implanted into the surrogate mother✓ Any 5

OR

Plants:

- A plant with the desired characteristics is selected✓
- A vegetative part of the 'parent' plant structure is removed✓
- and placed inside a growth medium✓
- to supply nutrients✓ /hormones
- to stimulate growth✓ (5)

3.1.2

- (Exact copies) of the most productive livestock✓ are made
- (Exact copies) of animals with desired characteristics✓ are made
- Conservation of endangered species✓
- Replacement of damaged tissues/organs✓ Any (3)

(Mark first THREE only) **(8)**

3.2

- All stickleback fish had spikey fins✓ originally
- In the lakes there were less /no predators✓
- The fish did not use the spikey fins anymore✓ /they used their fins less and their spikes disappeared✓
- The acquired characteristic of no spikes was then passed on to the next generation✓
- Eventually all the fish had no spikes✓ Any (5)

3.3 3.3.1

Skull A	Skull B
Rectangular /U-shaped palate✓	Rounded /C- shaped / semi-circular /parabolic palate✓
Large canines✓ /teeth	Small canines✓ /teeth
Foramen magnum in a more backward position✓	Foramen magnum in a more forward position✓
Large jaw✓	Small jaw✓
Prognathous✓ /more protruding jaws	Non-prognathous✓ /less protruding jaws
More pronounced zygomatic arches✓	Less pronounced zygomatic arches✓
Gaps /diastema between the teeth✓	No gaps/diastema between the teeth✓

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

3.3.2 It is short and wide✓✓ (2)

(9)

3.4	3.4.1	(By) mosquitoes✓	(1)
	3.4.2	(a) Use of antimalarial drugs✓	(1)
		(b) Drug resistance✓	(1)
	3.4.3	$\frac{551}{1\,485}$✓ x 100✓ = 37,1✓%	(3)
	3.4.4	(a) - Blood samples only collected from people taking the anti-malarial drug✓ - The same affected area of collection✓ of blood samples - The same villages✓ were used for the investigation - The same laboratory✓/environmental conditions where samples were kept **(Mark first TWO only)** Any	(2)
		(b) - Repeated three times✓ - Done in seven villages✓ - Duration over a year✓ - A sample of 1 485 was collected✓ **(Mark first TWO only)**	(2)
	3.4.5	- There was variation in the malaria parasite population✓ - Some parasites were resistant to the antimalarial drugs✓ and - others were not✓ - When parasites were exposed to the antimalarial drugs✓ - Those that were not drug resistant did not survive✓/died - Those that were resistant to the drugs survived✓ and - reproduced✓ and - passed the allele for drug resistance to their offspring✓ - The next generation had a higher proportion of parasites with drug resistance✓ Any	(7) **(17)**
	3.5.1	2✓/ Two	(1)
	3.5.2	2 mya✓	(1)
	3.5.3	- Mrs Ples✓ - Taung child✓ - Little foot✓ **(Mark first TWO only)** Any	(2)
	3.5.4	- (Fossils of) *A. africanus* were found in Africa only✓ - (Fossils of) *H. habilis* were found in Africa only✓ - Oldest fossils of *H. erectus* / *H. sapiens* were found in Africa✓ - while the younger fossils were found in other parts of the world✓	(4)
	3.5.5	- *H. sapiens* have a bigger brain volume than *H. habilis*✓, therefore - *H. sapiens* are more intelligent than *H. habilis*✓ - Leading to *H. sapiens* developing more complex tools✓/ *H. sapiens* made more specialised tools	(3) **(11)** **[50]**

TOTAL SECTION B: 100
GRAND TOTAL: 150