



Northern Cape Department of Education

**PROVINSIALE VOORBEREIDENDE EKSAMEN/
PROVINCIAL PREPARATORY EXAMINATION**

GRAAD/GRADE 12

LEWENSWETENSKAPPE/LIFE SCIENCES

VRAESTEL/PAPER 2

SEPTEMBER 2026

PUNTE/MARKS: 150

TYD/TIME: 2½ uur/hours

**Hierdie vraestel bestaan uit 15 bladsye./
This question paper consists of 15 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. Make 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 1.1.10) in the ANSWER BOOK, e.g. 1.1.11 D.

1.1.1 The position of a gene on a chromosome is called ...

- A a locus.
- B an allele.
- C a centromere.
- D a chiasma.

1.1.2 Crossing over is a mechanism which allows homologous chromosome pairs to ...

- A arrange themselves on the equator.
- B reduce genetic variation.
- C exchange DNA.
- D pair off with each other.

1.1.3 The evolutionary theory of punctuated equilibrium was proposed by ...

- A Darwin and Wallace.
- B Lamarck and Darwin.
- C Eldredge and Gould.
- D Wallace and Mendel.

1.1.4 The structure of DNA was determined by using X-ray pictures produced by ...

- A Watson and Crick.
- B Franklin and Wilkins.
- C Watson and Franklin.
- D Crick and Franklin.

1.1.5 The following statements are characteristics of DNA:

- (i) Double-stranded helix
- (ii) Sugar molecule is deoxyribose
- (iii) Found in the chloroplast
- (iv) Consists of T, A, G and C nitrogenous bases

Which of the statements are characteristics of DNA in plants?

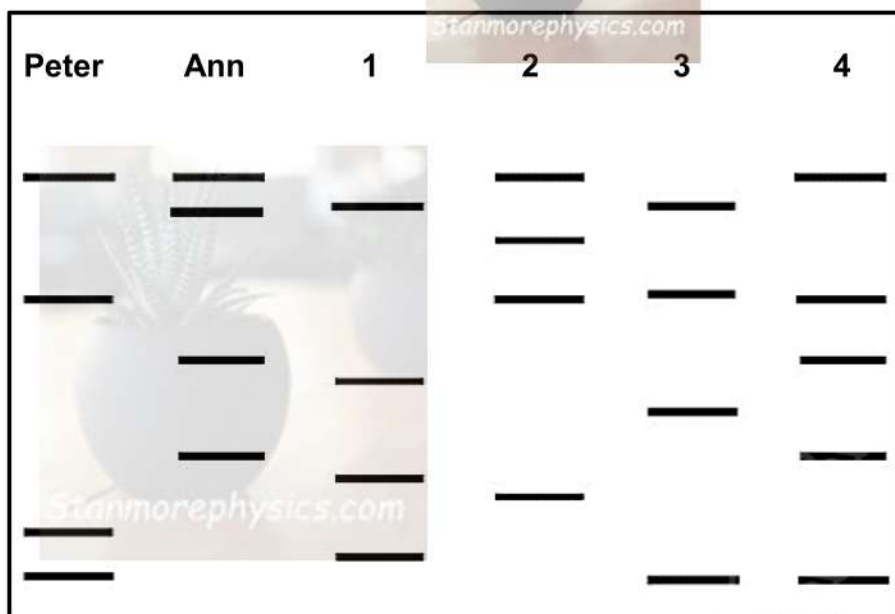
- A (i), (ii) and (iii) only
- B (i) and (iv) only
- C (i), (ii) and (iv) only
- D (i), (ii), (iii) and (iv)

- (i) Down syndrome
- (ii) Sickle cell anaemia
- (iii) Haemophilia
- (iv) Colour blindness

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

RNA profiles of Pete
A profiles represent

Which ONE of the following DNA profiles represents Ann and Peter's son?



- | | |
|---|---|
| A | 1 |
| B | 2 |
| C | 3 |
| D | 4 |

1.1.8 Which ONE of the following describes the significance of DNA replication?

- A It ensures variation amongst offspring.
- B It ensures that the chromosome number remains constant.
- C It prevents the doubling of DNA at the end of meiosis.
- D It forms strands that are not identical to each other.

QUESTIONS 1.1.9 AND 1.1.10 REFER TO THE FOLLOWING GENETIC CROSSING:

In humans, having freckles (**F**) is dominant to not having freckles (**f**). Green eyes (**G**) are considered to be dominant over blue eyes (**g**). The inheritance of these traits is represented in the Punnet square below.

		 Male genotype FfGg			
 Female genotype Ffgg	Gametes	FG	Fg	fG	fg
	Fg	FFGg	FFgg	FfGg	1
	fg	2	Ffgg	3	4

1.1.9 Child number **2** would be ...

- A homozygous for having freckles and heterozygous for eye colour.
- B homozygous for both traits.
- C heterozygous for both traits.
- D homozygous for having no freckles and heterozygous for eye colour.

1.1.10 Which child has freckles and blue eyes?

- A 1
- B 2
- C 3
- D 4

(10 x 2) **(20)**

- 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 1.2.8) in the ANSWER BOOK.

- 1.2.1 The natural shape of RNA
- 1.2.2 The phase of the cell cycle during which DNA replication occurs
- 1.2.3 The building blocks that form DNA and RNA
- 1.2.4 A change in the sequence of nitrogenous bases resulting in the formation of a different protein
- 1.2.5 The nucleic acid inherited from mothers
- 1.2.6 The sugar present in RNA
- 1.2.7 The nitrogenous base which is present in RNA but not in DNA
- 1.2.8 A genetic inheritance where neither allele is dominant (8 x 1) **(8)**

- 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 type of variation where there is a range of intermediate phenotypes	A: Discontinuous B: Continuous
1.3.2	Influences the number of species on Earth	A: Extinction B: Speciation
1.3.3	The bond between two nitrogenous bases	A: Hydrogen bond B: Peptide bond

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

- 1.4 The table below shows the blood groups of three brothers and their parents. Use the table to answer the questions that follow.

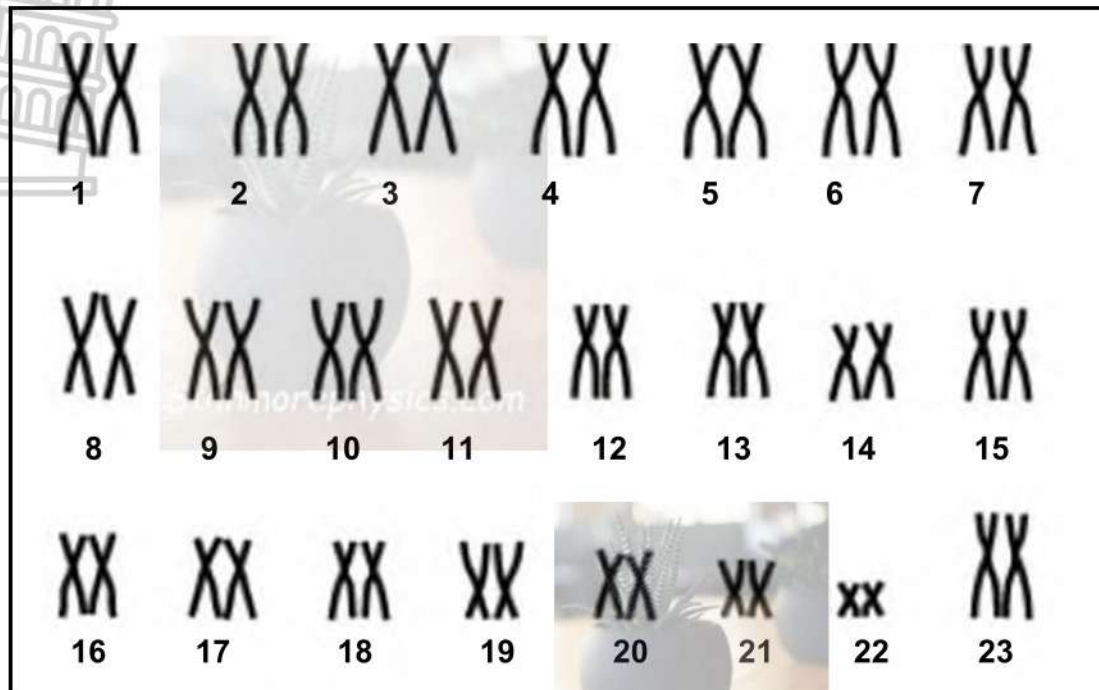


PERSON	BLOOD GROUPS
Keagan	B
Denwion	A
Ethan	O
Father	A
Mother	Not stated

- 1.4.1 How many alleles control the blood groups? (1)
- 1.4.2 Give the phenotype of the mother's blood group. (1)
- 1.4.3 Provide the genotype for the blood group of: (1)
- (a) Keagan (1)
- (b) Denwion (1)
- 1.4.4 Name ALL the individuals who is/are (1)
- (a) homozygous recessive. (1)
- (b) heterozygous for blood group **A**. (2)
- 1.4.5 Identify the type of dominance expressed in the blood groups as shown in the table above. (1)
- 1.4.6 A fourth child is born to this family.
- What is the chance in percentage of him/her having blood group **AB**? (1)

(9)

- 1.5 The diagram below represents the set of chromosomes of a human somatic cell.



- 1.5.1 Name the type of diagram. (1)
- 1.5.2 How many autosomes are there in the nucleus of this cell? (1)
- 1.5.3 How will chromosome pair 23 differ if this was a cell of a male? (1)
- 1.5.4 If this individual had Down syndrome, give the number of:
- (a) The chromosome pair in the diagram that will be affected. (1)
 - (b) Chromosomes that will be at the position mentioned in QUESTION 1.5.4 (a). (1)
- 1.5.5 What is the biological term used when chromosome pairs do not separate during meiosis? (1)
- 1.5.6 Name the type of reproductive cell that results from meiosis in humans. (1)

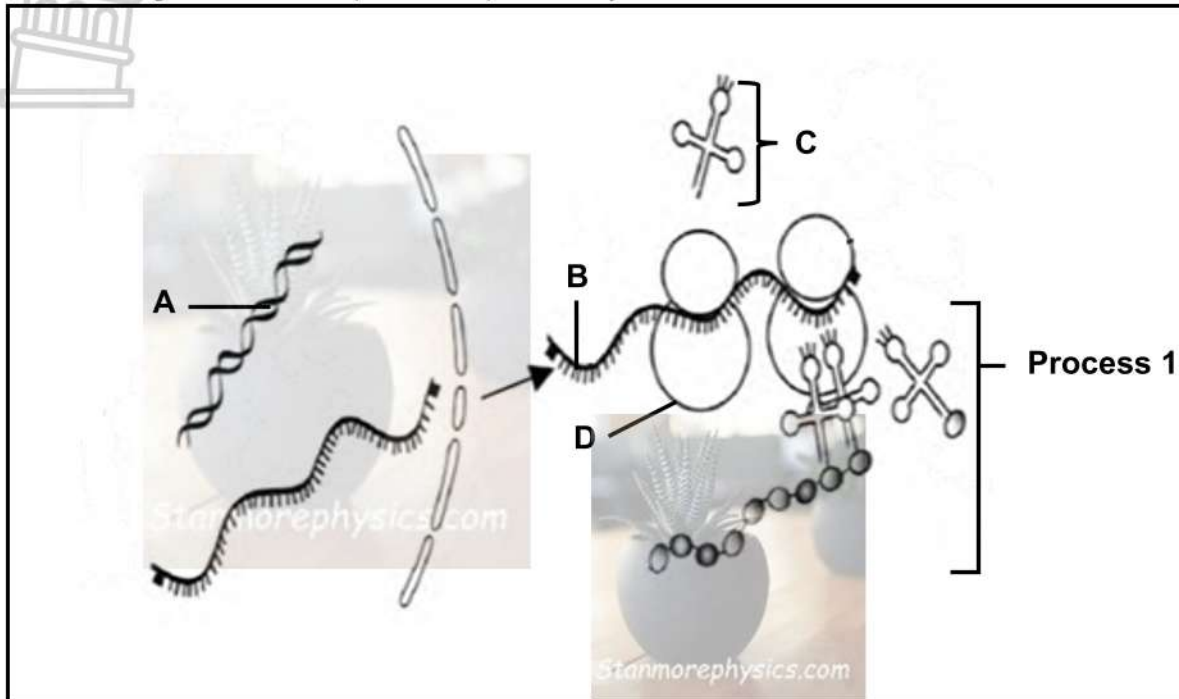
(7)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 The diagram below represents protein synthesis.



2.1.1 Identify:

(a) Molecule **A** (1)

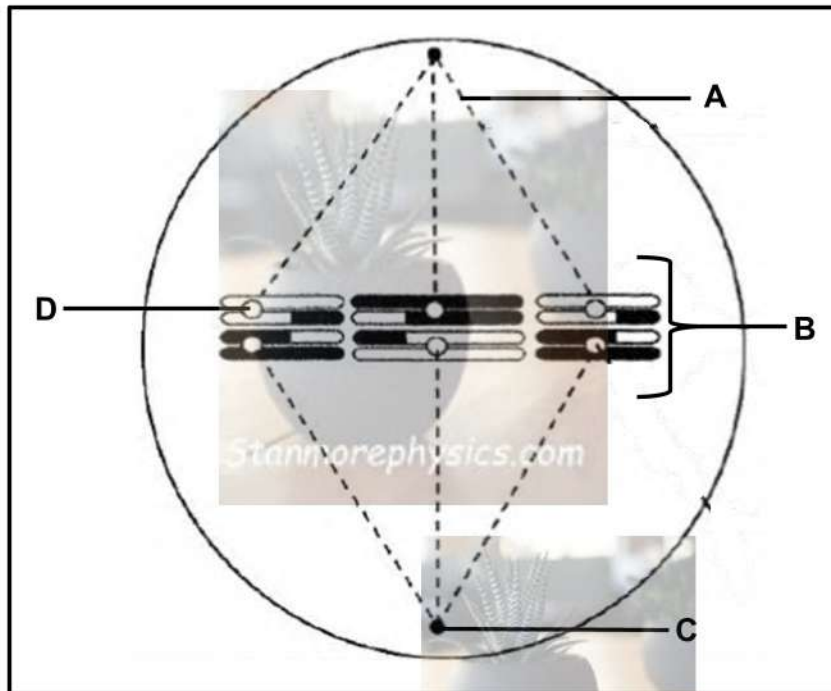
(b) Organelle **D** (1)

2.1.2 Where in the cell does **Process 1** take place? (1)

2.1.3 Explain the importance of molecule **C** during **Process 1**. (2)

2.1.4 Tabulate TWO differences between *transcription* and *DNA replication*. (5)
(10)

2.2 The diagram below represents a phase in meiosis.



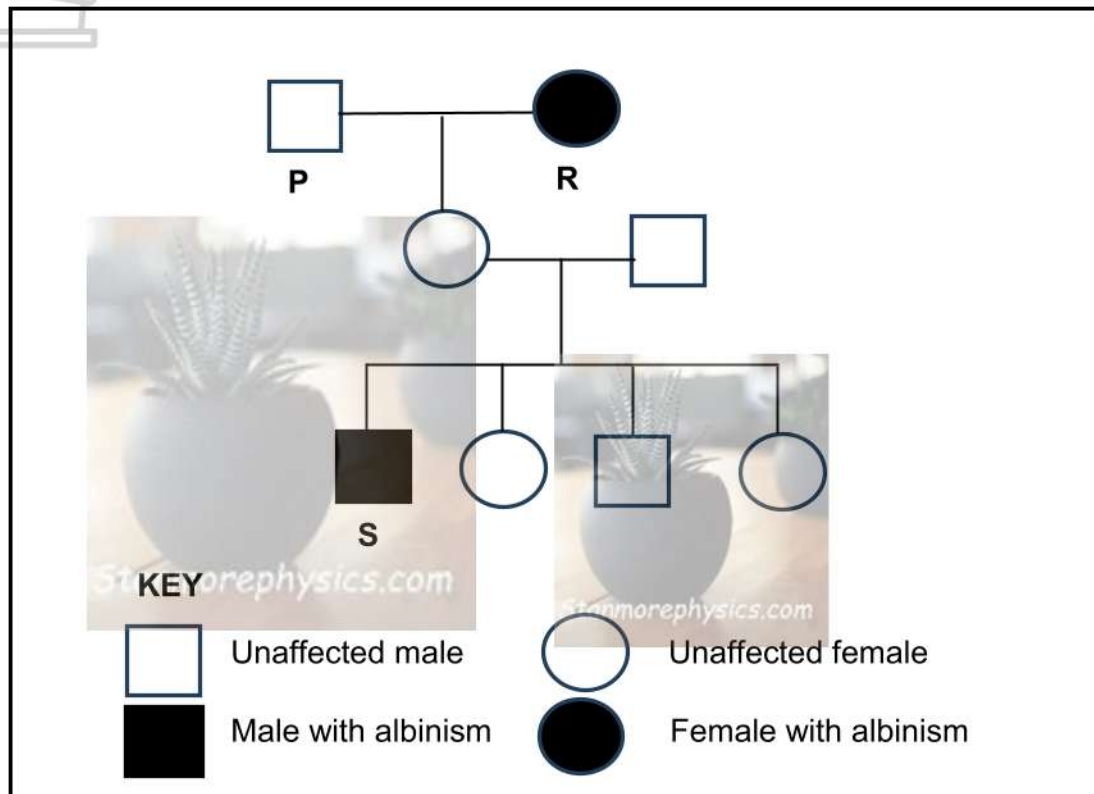
- 2.2.1 Give the LETTER and the NAME of the structure that will pull the chromosomes towards the opposite poles. (2)
- 2.2.2 Identify the phase of meiosis shown in the diagram. (1)
- 2.2.3 Provide ONE visible reason for the answer to QUESTION 2.2.2. (2)
- 2.2.4 Explain how the phase of meiosis, shown in the diagram, contributes to natural selection in species. (5)
- 2.2.5 Assume that a specific cell has FOUR chromosomes.

Draw TWO labelled diagrams to differentiate between Anaphase 1 and Anaphase 2 of meiosis in **this** cell.

DO NOT provide a label for structure **A** in your diagrams. (5)
(15)

- 2.3 Albinism is a genetic condition that is not sex-linked. People with albinism are unable to produce the pigment melanin in their skin cells. Melanin is the pigment that gives colour to the skin, hair and eyes. Albinism is caused when an individual is homozygous recessive for this characteristic.

The diagram below shows the inheritance of albinism in a family.



- 2.3.1 Indicate if the individuals below are homozygous dominant, homozygous recessive or heterozygous.

(a) **S** (1)

(b) **P** (1)

- 2.3.2 Explain how you reached your conclusion to QUESTION 2.3.1 (b). (3)

- 2.3.3 Calculate the percentage of the males in the family with albinism. (3)
(8)

- 2.4 Use a genetic cross to show how gender in human offspring is determined. (6)

- 2.5 Pea plants may be infected by viruses, thereby reducing the yield of pea seeds. A virus-resistant variety of pea plant was developed through genetic modification.

Two varieties of the same species of pea plants were grown:

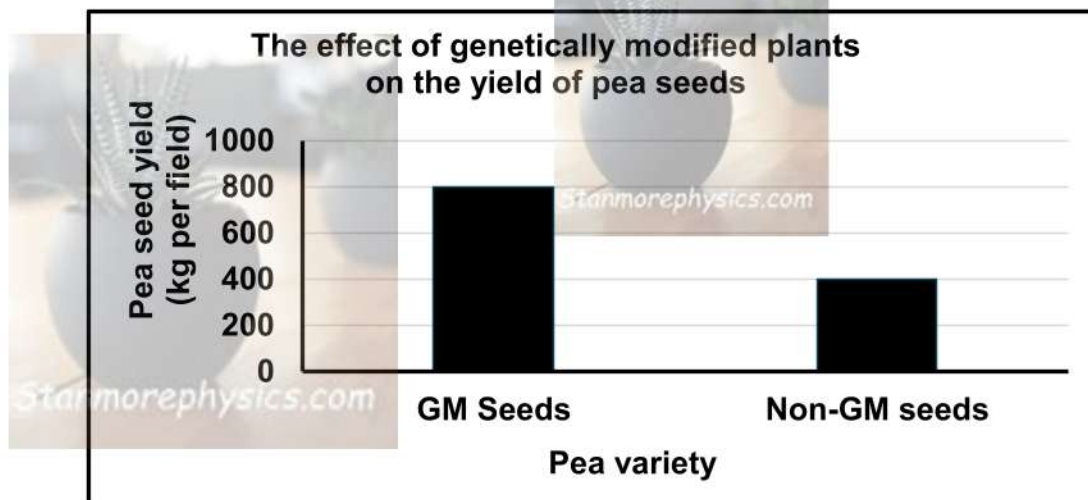
- The genetically modified pea seeds (**GM seeds**)
- Non-genetically modified pea seeds (**Non-GM seeds**)

Scientists wanted to investigate whether the genetically modified plants affect the yield of pea seeds.

The following method was used:

- Both seed types were grown in two separate fields of the same size.
- 400 pea seeds were grown in each field for each type of pea.
- 80 kg of NPK fertiliser was applied in each field.

The results of the investigation are shown in the graph below.



- 2.5.1 State the aim of this investigation. (2)
- 2.5.2 Give: (11)
- (a) The dependent variable for this investigation. (1)
 - (b) ONE way in which the reliability of this investigation was ensured. (1)
 - (c) TWO factors that were kept constant during this investigation. (2)
- 2.5.3 Explain why the non-genetically modified seeds were included in the investigation. (3)
- 2.5.4 Give a conclusion based on the results of this investigation. (2)

(11)
[50]

QUESTION 3

- 3.1 In pea plants (*Pisum sativum*), purple flowers (**F**) are dominant over white flowers (**f**) and tall stems (**T**) are dominant over short stems (**t**).

A plant that is heterozygous for purple flowers and heterozygous for tall stems is crossed with a plant that has white flowers and short stems.

3.1.1 Identify the type of crossing represented in the scenario above. (1)

3.1.2 What is the genotype of the plant with white flowers and short stems? (1)

3.1.3 Two plants which are both heterozygous for both characteristics pollinate each other.

Give:

(a) ALL possible gametes for the parent plants (2)

(b) The phenotype of a plant with the genotype **FFtt** (1)

(5)

- 3.2 Read the extract below and answer the questions.

Today, capuchin monkeys spend most of their time moving through the upper parts of the forest trees. They have long, flexible tails that help them grip branches and maintain balance while climbing, which helps protect them from predators on the ground. Scientists believe that their early ancestors had much shorter tails and were less adapted to life high in the trees.

3.2.1 Give ONE advantage that capuchin monkeys with longer tails have. (1)

3.2.2 Using Lamarck's theory of evolution, explain the difference in the length of the tail of the capuchin monkey. (4)

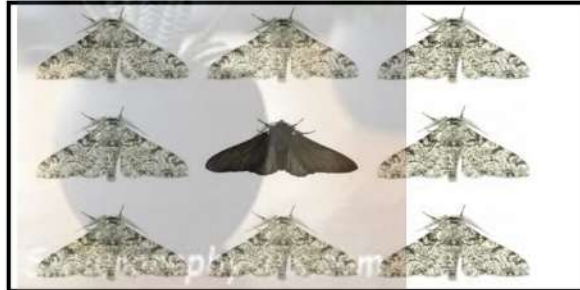
3.2.3 Why were Lamarck's theories rejected? (2)

(7)

- 3.3 Describe how fossil evidence is used to support the 'Out of Africa' hypothesis. (5)

- 3.4 The following text describes how natural selection was observed in the peppered moth.

'JUMPING GENE' TOOK PEPPERED MOTHS TO THE DARK SIDE



The peppered moth (*Biston betularia*) demonstrated rapid evolution due to the Industrial Revolution. The Industrial Revolution took place when manual labour was replaced with machines and air pollution was introduced on Earth. As a result of increased air pollution, tree trunks and buildings became black in colour.

The moths were originally light-coloured but evolved to a darker form during the Industrial Revolution in the 19th century. In the 20th century, the lighter moth became common again as laws were introduced to reduce air pollution created by factories.

Only in 2016 did scientists discover that the dark colour was caused by a *jumping gene* mutation. A *jumping gene* is a specific segment of DNA that changes its position, through which the gene 'jumps' to a different location within a genome.

[Source: doi:10.1038/nature17951]

- 3.4.1 What is meant by a *biological species*? (2)
- 3.4.2 (a) Name the type of mutation which occurred in the pepper moth. (1)
- (b) Explain why this type of mutation is regarded as a useful mutation. (2)
- 3.4.3 Explain how the increase of air pollution benefited the dark-coloured moths in their competition for survival according to Darwin's evolution theory. (4)
- 3.4.4 Using the theory on natural selection describe why the light-coloured moths became increased in numbers during the 20th century. (2)

(11)

- 3.5 There are physical (anatomical) differences between African apes and humans. There are also characteristics that they share.

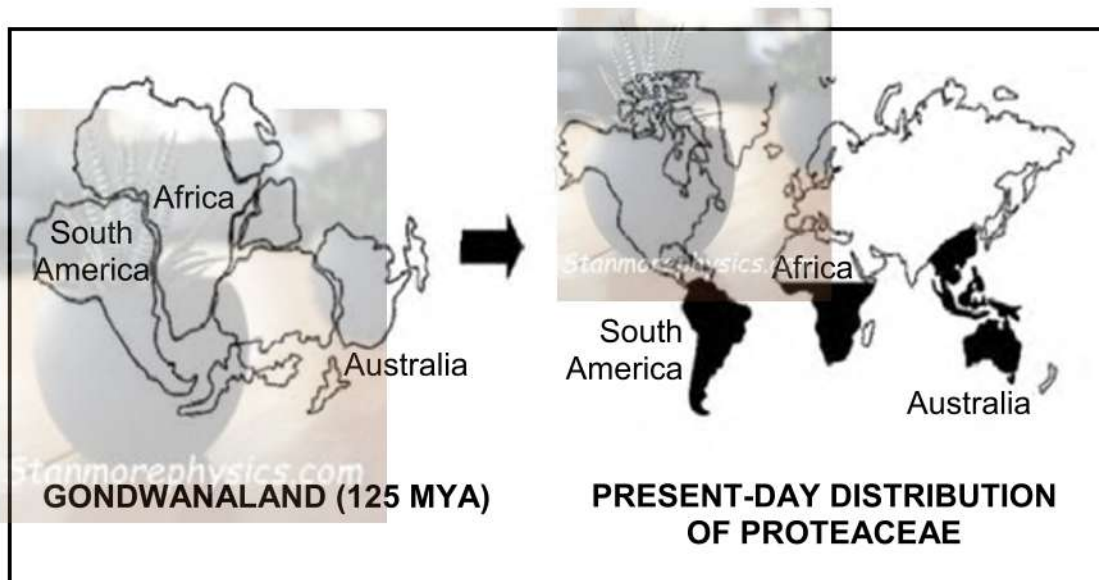
3.5.1 Name ONE characteristic of the hand of the African apes that they share with humans. (1)

3.5.2 Explain the significance of THREE evolutionary changes to the human skull. (6)

3.5.3 Explain the difference between the size of the teeth of humans and the African apes. (4)

(11)

- 3.6 Different species of *Proteaceae* can be found in the Southern Hemisphere. As illustrated in the diagram below, the waratah is found in Australia, the protea in South Africa and the Chilean Firebush in South America.



3.6.1 Explain how it happened that the plants were distributed across the Southern Hemisphere. (2)

3.6.2 Explain how speciation through geographic isolation took place in the *Proteaceae*. (7)

3.6.3 Describe how scientists would determine that the plants are different species. (2)

(11)

[50]

TOTAL SECTION B: 100
GRAND TOTAL: 150



Northern Cape Department of Education

PROVINCIAL PREPARATORY EXAMINATION

GRADE 12

LIFE SCIENCES

PAPER 2

SEPTEMBER 2026

MARKING GUIDELINES

MARKS: 150

These marking guidelines consist of 12 pages.

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 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 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.



SECTION A

QUESTION 1

- 1.1 1.1.1 A ✓✓
 1.1.2 C ✓✓
 1.1.3 C ✓✓
 1.1.4 B ✓✓
 1.1.5 D ✓✓
 1.1.6 B ✓✓
 1.1.7 D ✓✓
 1.1.8 B ✓✓
 1.1.9 C ✓✓
 1.1.10 A ✓✓ (10 x 2) **(20)**
- 1.2 1.2.1 Single strand ✓
 1.2.2 Interphase ✓
 1.2.3 Nucleotides ✓
 1.2.4 (Gene) mutation ✓
 1.2.5 Mitochondrial DNA ✓/mtDNA
 1.2.6 Ribose ✓
 1.2.7 Uracil ✓
 1.2.8 Incomplete dominance ✓ (8 x 1) **(8)**
- 1.3 1.3.1 B only ✓✓
 1.3.2 Both A and B ✓✓
 1.3.3 A only ✓✓ (3 x 2) **(6)**
- 1.4 1.4.1 3✓/Three (1)
 1.4.2 (Blood group) B ✓ (1)
 1.4.3 (a) I^Bi ✓ (1)
 (b) I^Ai ✓ (1)
 1.4.4 (a) Ethan ✓ (1)
 (b) Denwion ✓ and the father ✓ (2)
 1.4.5 Complete ✓ dominance (1)
 1.4.6 25✓% (1)
(9)

- 1.5 1.5.1 Karyotype ✓ (1)
- 1.5.2 44 ✓ (1)
- 1.5.3 The one chromosome (X-chromosome) will be much larger than the other one (Y-chromosome) ✓/There will be one X-chromosome and one Y-chromosome/ XY (1)
- 1.5.4 (a) 21 ✓ (1)
(b) 3 ✓ (1)
- 1.5.5 Non-disjunction ✓ (1)
- 1.5.6 Gametes ✓ (1)
(7)

TOTAL SECTION A: 50



SECTION B

QUESTION 2

- 2.1 2.1.1 (a) DNA✓/Deoxyribonucleic acid✓ (1)
(b) Ribosome ✓ (1)

- 2.1.2 Cytoplasm/ ribosome✓ (1)

- 2.1.3 - It (tRNA) brings **specific** amino acids✓
- to the ribosome✓
- to form the **required/desired** protein✓ (Any 2 x 1) (2)

2.1.4

TRANSCRIPTION	DNA REPLICATION
Part of the DNA unwinds ✓	The whole DNA molecule unwinds ✓
One DNA strand acts as a complement ✓/template	Both DNA strands act as templates ✓
Adenine pairs up with uracil ✓	Adenine bonds with thymine✓
mRNA codons receive code from DNA basis triplets✓	DNA nucleotides bond with DNA nucleotides ✓
Takes place during protein synthesis✓	Takes place during cell division ✓/mitosis/meiosis
A mRNA molecule is formed✓ at the end	A (identical) DNA molecule is formed✓
Any TWO comparisons + correct table format (T✓) (Mark first TWO only)	

(5)
(10)

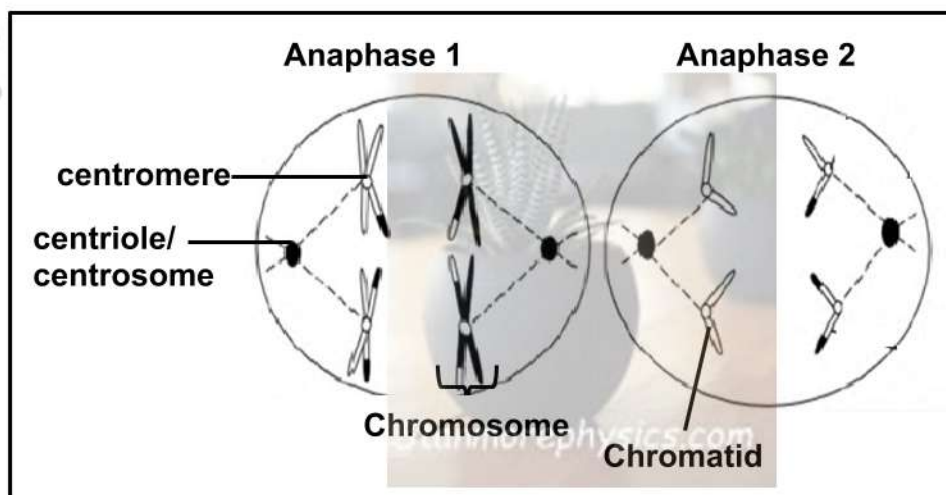
- 2.2 2.2.1 A ✓ - Spindle fibre ✓/thread (2)

- 2.2.2 Metaphase I ✓/one (1)

- 2.2.3 Homologous chromosome **pairs** ✓
are aligned at the equator✓ of the cell (2)

- 2.2.4 - **Random arrangement of chromosomes** ✓*
- forms cells that differ genetically. ✓
- This leads to increased genetic variation in a population ✓
- which will cause some individuals to have a favourable characteristic and others/some to have unfavourable characteristics ✓
- When environmental conditions change ✓
- those with favourable characteristics will survive ✓
- and those with unfavourable characteristics will die ✓
* **Compulsory mark** + Any 4 (5)

2.2.5



Criteria to assess diagrams		
Criteria	Letter	Mark
Correct headings for both drawings	H	1
Chromosomes/chromatids appearance indicate crossing over	C	1
Chromosomes/chromatids pulled towards opposite poles	P	1
ANY TWO correct labels	L	2

No marks for spindle fibre(s) (Label A)

(5)
(15)

- 2.3 2.3.1 (a) Homozygous recessive ✓ (1)
- (b) Homozygous dominant ✓/heterozygous (1)



2.3.2 **DO NOT ACCEPT ANY GENOTYPES AS NO GENOTYPES WERE GIVEN**

- Individual **P** is an unaffected✓ male
- therefore, **P**/he has ONE dominant allele✓/'unaffected' allele
- Individual **R** is homozygous recessive✓/has two alleles for albinism/is a female with albinism
- In the child/offspring, the dominant allele of the father/**P** masks the recessive allele received from the mother/**R** ✓

OR

- The unaffected condition is (expressed in) the dominant condition✓
- which can be expressed either as homozygous dominant✓
- or in the heterozygous state when the dominant allele masks the recessive allele ✓

(3)

2.3.3 $\frac{1}{4} \checkmark \times 100 \checkmark = 25 \checkmark \%$

(3)
(8)

2.4

P₁ Phenotype: Male x Female ✓
 Genotype: XY x XX ✓

Meiosis

Fertilisation

F₁ Genotype: $\begin{matrix} X & Y \\ \swarrow & \searrow \\ XX & XY \end{matrix}$: $\begin{matrix} X & X \\ \swarrow & \searrow \\ XY & XX \end{matrix}$
 Phenotype: Female : Male ✓

P₁ and F₁ ✓
 Meiosis & Fertilisation ✓

OR

P₁ Phenotype: Male x Female ✓
 Genotype: XY x XX ✓

Meiosis

Fertilisation

F₁ Phenotype: Female : Male ✓

P₁ and F₁ ✓

Meiosis & Fertilisation ✓

	X	Y
X	XX	XY
X	XX	XY
1 mark for correct gametes		
1 mark for correct genotypes		

Any 6

(6)

- 2.5 2.5.1 To investigate whether /determine how genetically modified plants affect the yield of pea seed ✓✓ **(TWO or nothing)** (2)
- 2.5.2 (a) Yield of pea seed✓ (1)
- (b) 400 pea seeds were grown in each field ✓ (1)
- (c) - (Same) size of field✓
 - (Same) type/NPK of fertiliser✓
 - 80 kg/amount of fertiliser given to **each field** ✓
 - **400** pea seeds sown on **each field**✓
 - (Same) species of (pea) plant (**not seed**)
Only take information stated in the passage
(Mark first TWO only) Any (2)
- 2.5.3 - To serve as control✓
 - so that it can be compared with the other group✓
 - and show that the inserted gene is the only factor that affected the results ✓/ensures validity of investigation (3)
- 2.5.4 Genetically modified pea seed produces 800 kg per field and non-genetically modified pea seed 400 kg per field✓✓
- OR**
- Genetically modified pea seed produces a larger yield per field than the non-genetically modified pea seed ✓✓ **(TWO OR NOTHING)** (2)

(11)

[50]

QUESTION 3

- 3.1 3.1.1 Dihybrid✓ cross (1)
- 3.1.2 ffft/ttff✓ (1)
- 3.1.3 (a) FT, Ft, fT, ft ✓✓ (TWO or nothing) (2)
- (b) Purple flowers with short stems✓ (1)
- (5)
- 3.2 3.2.1 - It helped them grip branches✓ and
 - maintain balance while climbing ✓
 (Mark first ONE only) Any (1)
- 3.2.2 - The ancestors of capuchin monkeys had short tails✓
 - The ancestors continually stretched✓/used their tails
 - to be able to grip onto tree branches✓/maintain balance
 - As a result, their tails became longer✓ and
 - this **characteristic** was passed on to the next generation✓
 Any (4)
- 3.2.3 - There is no evidence to show that acquired traits✓
 are inherited ✓.
 - There is no evidence that structures used more/less
 frequently✓
 became more/less developed✓.
 - A change in phenotype✓/physical appearance
 does not lead to a change in genotype✓/genetic material.
 Any 1 x 2 (2)
- (7)
- 3.3 - **Fossils** of *Ardipithecus* were found in Africa only✓
 - **Fossils** of *Australopithecus* were found in Africa only✓
 - **Fossils** of *Homo habilis* were found in Africa only✓
 - The oldest **fossils** of *Homo erectus* were found in Africa✓
 - The oldest **fossils** of *Homo sapiens* were found in Africa✓ (5)

- 3.4 3.4.1 A group of organisms with similar characteristics✓
 that can interbreed to produce fertile offspring.✓ (2)
- 3.4.2 (a) (Jumping) gene✓ mutation (1)
- (b) The change in the (gene responsible for the) colour of the moth✓
 prevented the moth from being eaten✓/camouflaged the moth from the predators (2)
- 3.4.3 - The favourable characteristic for moths is the dark colour✓
 - which ensures the blend/match with the smog covered trees in the polluted environment✓
 - and therefore, they will survive.✓
 - The unfavourable characteristic for moths is the light colour✓, and they do not blend/match with the smog covered trees in the polluted environment✓
 - and therefore, they will die.✓ Any (4)
- 3.4.4 - The light-coloured moths survived **and** reproduced✓
 - passing the allele for the light colour in moths to their offspring✓ (2)
 (11)
- 3.5 3.5.1 - Bare fingertips✓/nails instead of claws
 - Opposable thumbs✓
 - Fingerprints ✓
 - Five fingers ✓/digits
 (Mark first ONE only) Any (1)
- 3.5.2 - More forward position of the foramen magnum ✓
 develops the ability to walk on two feet ✓/bipedalism
 - Larger cranium ✓/more rounded cranium
 increases the brain size ✓/more intelligent
 - Flatter face ✓/less sloping forehead/non-prognathous/more developed chin/smaller canines/no diastema/prominent brow ridge appears
 due to softer food ✓/smaller muscles for chewing
 - Well-developed chin ✓
 enables the development of speech ✓ Any 3 x 2 (6)



3.5.3 Humans:

- teeth are smaller✓
suited to their diet of softer, cooked food✓

Apes:

- teeth/canines are larger✓
for grinding and chewing raw food✓

(4)

Credit if in a table – **do not credit the table**

(11)

- 3.6 3.6.1 - The continents drifted away from each other✓/continental drift took place
- Each continent ended with the plants of the original population on it✓

(2)

- 3.6.2 - The *Proteaceae* had one common ancestor✓
- When the continental drift ✓occurred
- the (*Proteaceae*) population was split✓ (into two) /became separated
- Since each population may be exposed to different environmental conditions✓/to different selection pressures
- natural selection occurs independently✓ in each population
- such that the individuals of the populations became very different✓ from each other
- genotypically and phenotypically✓
- to form different species.✓

Any

(7)

- 3.6.3 - They/the scientists would allow the plants to interbreed✓
to see if they can produce fertile offspring.✓
- DNA profiling was used✓
to compare that the DNA was different✓
- Pollination/fertilisation could not take place✓
because of different structures in flowers✓/different flowering seasons

(2)

(11)

[50]

TOTAL SECTION B: 100
GRAND TOTAL: 150