education

MPUMALANGA PROVINCE

REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES P2

SEPTEMBER 2025

MARKS: 150

TIME: 2½ HOURS

This question paper consists of 17 pages.

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INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. Answer ALL the questions.
2. Write ALL the answers in your 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. ALL drawings should be done in pencil and labelled in blue or black ink.
7. Draw diagrams 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 may use a non-programmable calculator, protractor and a compass.
11. Write neatly and legibly.

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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.

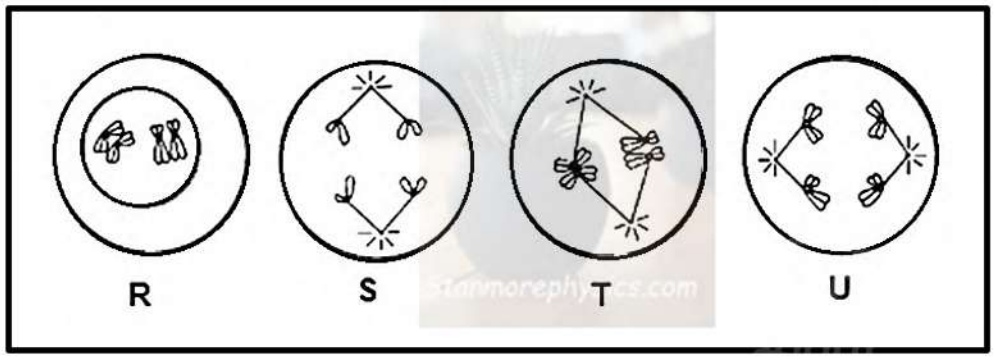
1.1.1 DNA and RNA are examples of…

A enzymes.
B nucleic acids.
C amino acids.
D proteins.

1.1.2 Which of the following human structures will contain a diploid chromosome number?

A Gametes
B Gonosomes
C Somatic cells
D Autosomes

1.1.3 Identify the phases that ensures genetic variation among individuals of the same species?



A R and T
B S, T and U
C R, S, T and U
D R only

1.1.4 Inheritance of multiple alleles in genetics refers to…

A one allele that influences more than one characteristic.
B two alleles that influence two characteristics.
C more than two alleles that influence two characteristics.
D more than two alleles that influence one characteristic.

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1.1.5 When two plants, one heterozygous for a characteristic and the other homozygous recessive are crossed, the expected ratio is:

A 3: 1
B 1: 3
C 1: 1
D 1: 2

1.1.6 For a particular characteristic, the offspring inherits …

A both alleles from the mother.
B one allele from the mother and one allele from the father.
C the alleles from either the mother or the father randomly.
D both alleles from the father.

1.1.7 Limbs of different species show similar structure but has different functions.

A Comparative embryology
B Modification by descent
C Biogeography
D Genetics

1.1.8 Organisms with similar characteristics that are able to interbreed and produce fertile offspring.

A Population
B Community
C Family
D Species

1.1.9 What is the type of variation where characteristics falls into distinct categories?

A Continuous
B Discontinuous
C Height
D Intelligence

1.1.10 Which of the following laws is used to explain Lamarckism?

A Survival of the fittest
B Inheritance of alleles
C Use and disuse
D Gradualism

(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 number (1.2.1 to 1.2.10) in the ANSWER BOOK.

1.2.1 The sugar molecule presents in a nucleotide of RNA

1.2.2 The bond that forms between amino acids in a protein molecule

1.2.3 The phase during which single chromosome strands become replicated chromosomes

1.2.4 Splitting of cytoplasm during telophase of meiosis

1.2.5 A sex-linked disorder that affects the photoreceptors in the eye

1.2.6 A cross between a white fowl and a black fowl produce a white and black speckled chicken

1.2.7 An organism's entire hereditary information, encoded either in DNA or RNA

1.2.8 Type of evolutionary evidence that focusses on tools, jewellery and rituals that gives insight into how early humans lived

1.2.9 A network of caves in South Africa where most human fossils has been found

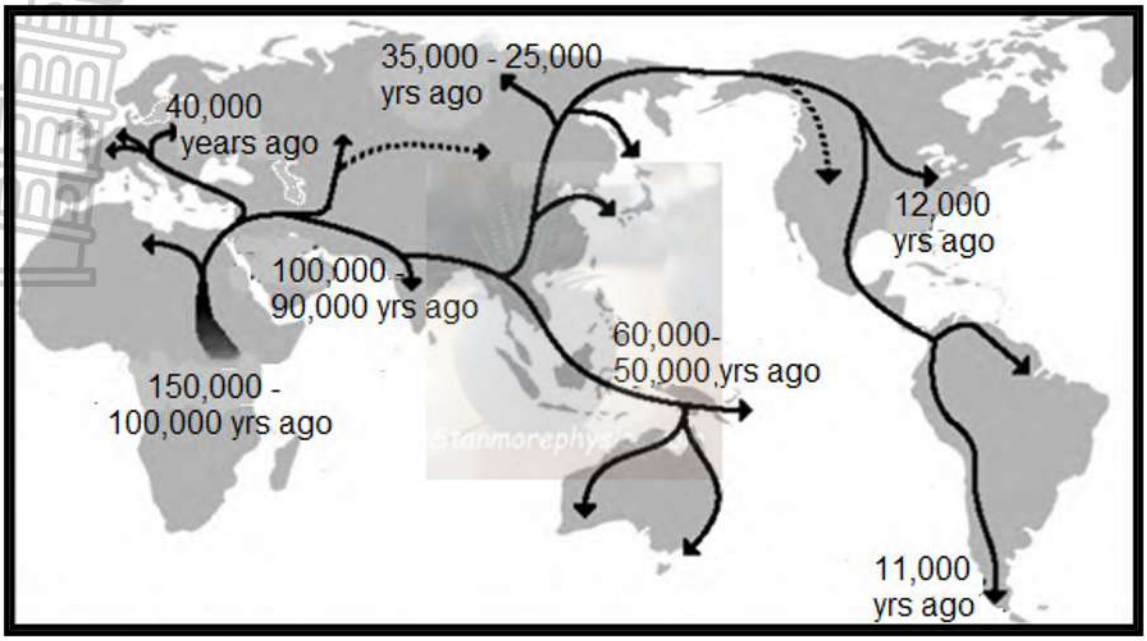
1.1.10 Having a long jaw that gives the face a sloped appearance (10 x 1) **(10)**

1.3 Indicate whether each of the statements 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 number (1.3.1 to 1.3.3) in the ANSWER BOOK.

COLUMN I		COLUMN II
1.3.1	Location of extra nuclear DNA in plant cells only	A: Mitochondria B: Nucleus
1.3.2	Mutation can occur in:	A: Gametes B: Somatic cells
1.3.3	During natural selection the surviving organisms have:	A: Favourable characteristics B: Desirable characteristics

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

1.4 The map below shows the possible migration patterns of humans across the world.



1.4.1 Identify the theory represented by the map above. (1)

1.4.2 Where did human life begin according to this map? (1)

1.4.3 Who were the first species to migrate from the point of origin? (1)

1.4.4 How long ago did humans appear in Europe? (1)

1.4.5 Which continent was the most recent to be occupied by humans? (1)

1.4.6 Which genera never migrated to other continents? (2)
(7)

1.5 In a certain type of pigeon, the allele for red eye colour (**R**) is dominant over the allele for black eye colour (**r**), and the allele for grey feathers (**G**) is dominant over allele for white feathers (**g**).

A heterozygous red-eyed pigeon with white feathers is crossed with a black-eyed, heterozygous grey feather pigeon.

1.5.1 State the genotype of the parents. (4)

1.5.2 Give:

(a) The recessive characteristic of EACH gene. (2)

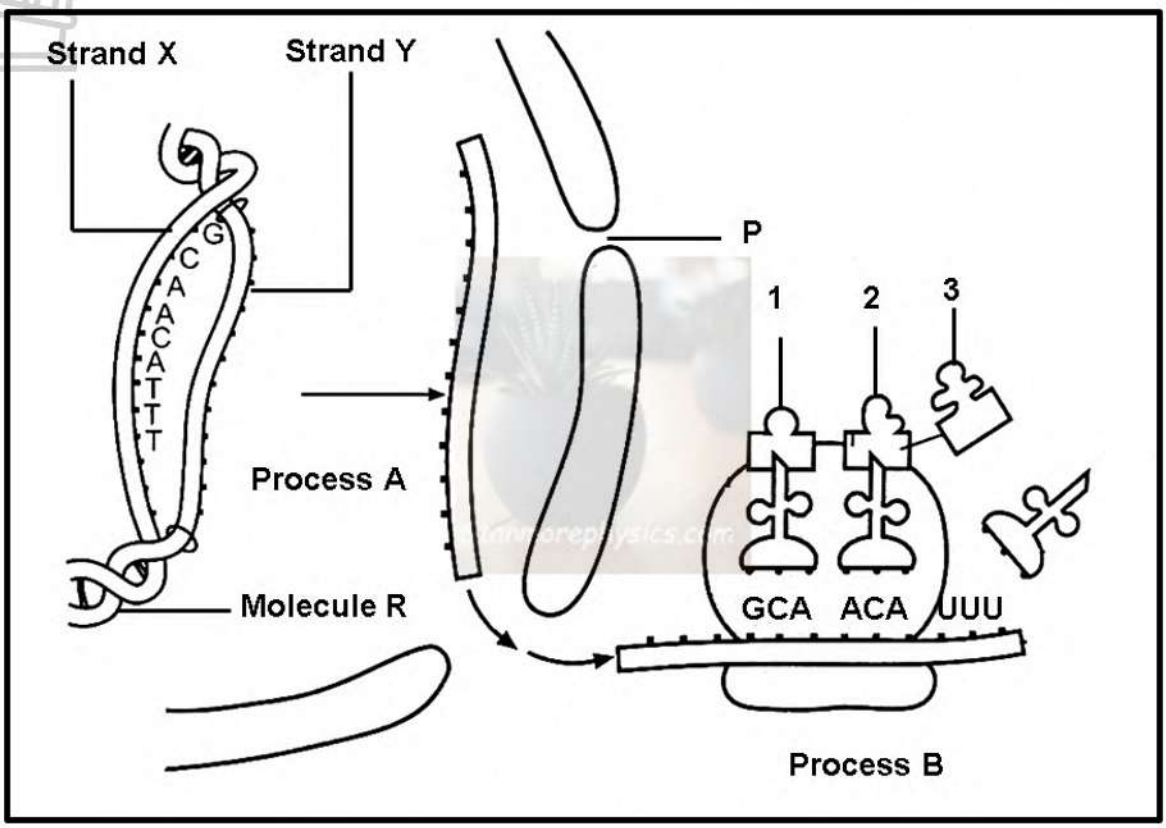
(b) ALL the possible genotypes of the gametes produced by a pigeon with black eye colour and grey feathers. (1)
(7)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 The diagram below represents two stages of protein synthesis. (The sequence of the nitrogenous bases in strand **X** is read from the top to the bottom)



2.1.1 State the function of structure **P** during process **A**. (1)

2.1.2 Strand **Y** acts as a template during process **A**.

Describe what is meant by a template. (1)

2.1.3 Give the sequence of the first base triplets on strand **Y**. (1)

2.1.4 Describe TWO differences between the process at **A** and **B**. (4)

2.1.5 The table below shows some tRNA anticodons with their corresponding amino acids.

tRNA anticodons	Amino acid
AAA	Phenylalanine
ACA	Threonine
CCA	Glycine
CGU	Alanine
UCU	Cysteine
GCA	Arginine
UGU	Cysteine

Use the table below to determine which amino acids are attached to tRNA molecules.

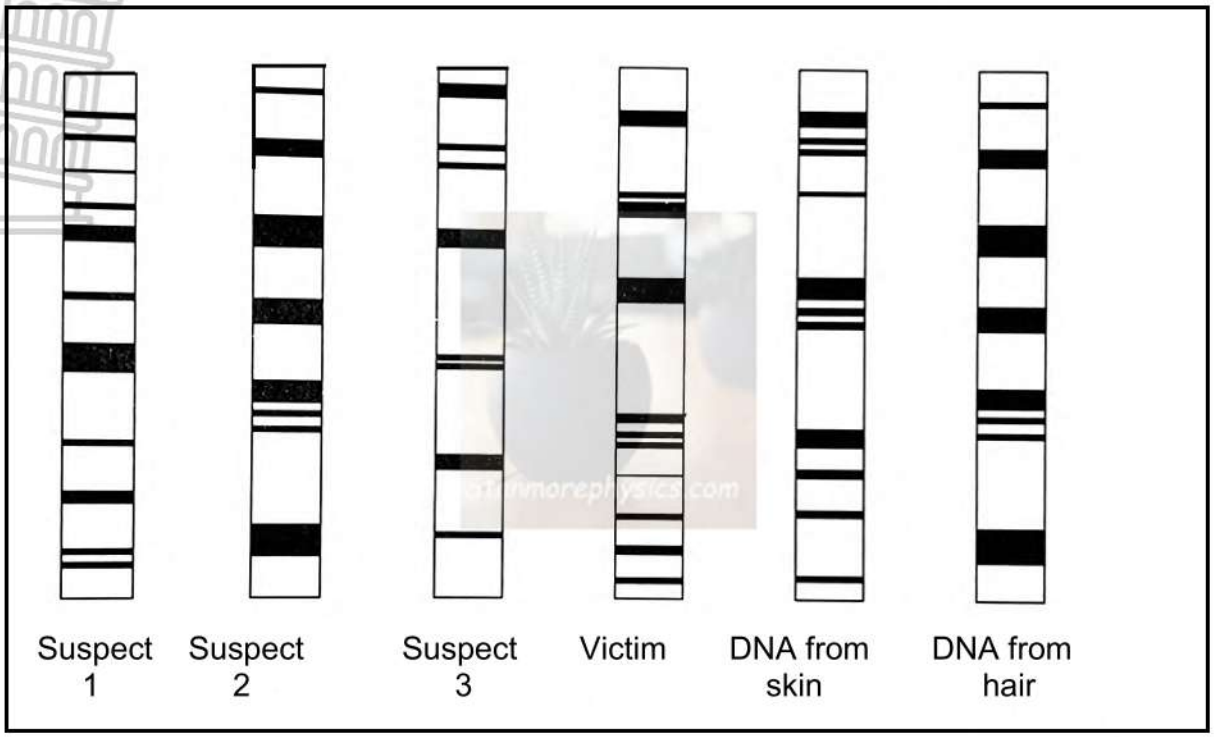
(a) **1** (1)

(b) **3** (1)

2.1.6 A mutation caused the second base triplets on strand **Y** to change from **TGT** to **TCT**.

Explain what effect this mutation has on the protein formed. (4)
(13)

2.2 An old woman was robbed, stabbed and left to die. Samples of blood were taken from the three suspects, crime scene and the victim to compare their DNA.



2.2.1 Identify the technique used. (1)

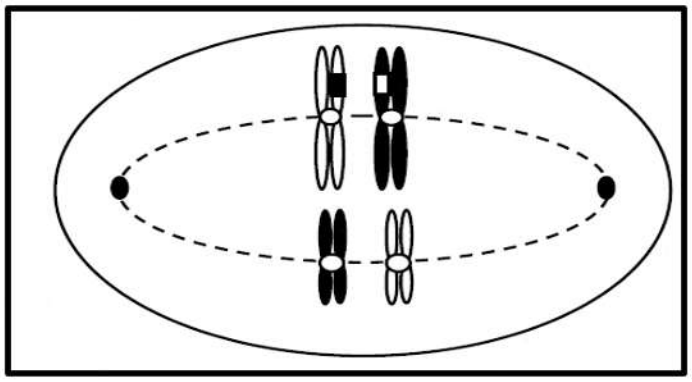
2.2.2 Which of the three suspects was present in the crime scene? (1)

2.2.3 Explain your answer to QUESTION 2.2.2. (2)

2.2.4 Explain why it cannot be concluded that the DNA from the hair and the skin of the victim were from the same person. (2)

2.2.5 Give TWO other uses for this technique. (2)
(8)

2.3 The diagram represents a cell undergoing meiosis.

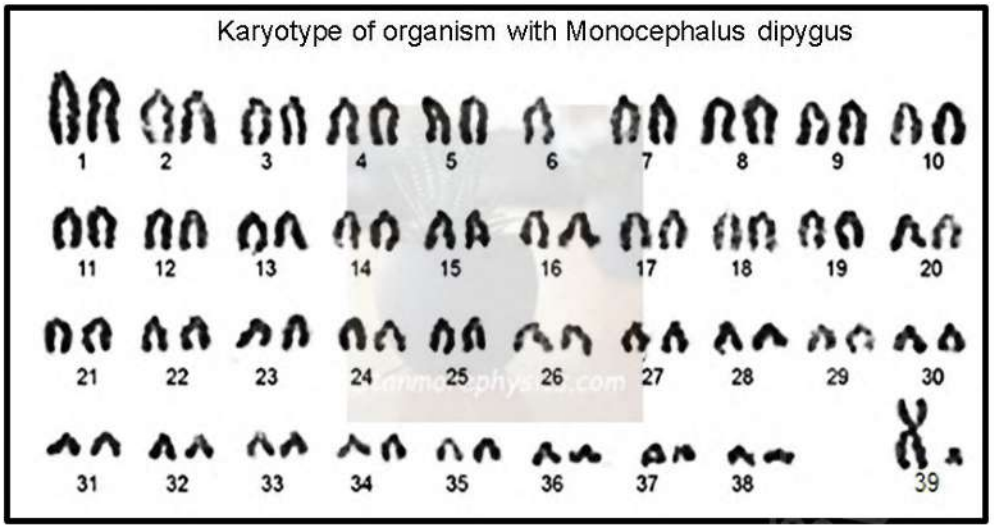


2.3.1 Identify the phase represented in the diagram above. (1)

2.3.2 Describe how the events taking place in the phase following the phase identified in QUESTION 2.3.1 differs during meiosis I and meiosis II. (2)

2.3.3 Draw a fully labelled diagram to represent ONE of the resulting cells at the same phase during meiosis II as represented in the diagram above. (4)
(7)

2.4 Monocephalus dipygus is a condition caused by a mutation. It results in the organism having duplicated organs, extra limbs and extra toes on their limbs.



2.4.1 Identify the gender of this organism. (1)

2.4.2 Does this karyotype belong to a *Homo sapien*? (1)

2.4.3 Give a reason for your answer in QUESTION 2.4.2 (2)

2.4.4 Name and describe the mutation as displayed in the karyotype above. (4)
(8)

2.5 Scientists investigated the use of stem cells to repair damaged hearts. The stem cells were injected into the ventricle's muscle tissue.

2.5.1 Name ONE source of stem cells. (1)

2.5.2 Explain why stem cells were used to repair the damaged heart. (3)

2.5.3 Explain why using stem cells from the same person is better than using stem cells from a donor. (2)
(6)

2.6 A man with blood group **AB** and a woman who is heterozygous for blood group **B** plan to have children.

2.6.1 How many alleles for blood group does an individual inherit? (1)

2.6.2 Explain why group **AB** is an example of co-dominance. (2)

2.6.3 Explain how it is possible for a man with blood **AB** and a woman with blood group **B** to have a child with blood group **A**. (5)
(8)
[50]

QUESTION 3

3.1 Machado-Joseph is a rare genetic condition that affects the nervous system. This condition is caused by an autosomal dominant allele and results in lack of control of motor-coordination, reflexes and eye movements. Symptoms of this condition are only visible after the age of 40.

3.1.1 Describe what is meant by an autosomal dominant allele. (2)

3.1.2 Suggest why the late development of the symptoms makes it difficult to reduce the number of people born with this condition? (2)

3.1.3 A man who is heterozygous for this condition has a child with a woman who is homozygous recessive.

Use a genetic cross to show the percentage chance of having a child with Machado-Joseph condition.

Use the letter **D** for the dominant allele and **d** for the recessive allele. (6)
(10)

3.2 Read the passage below.

Scientists created genetically modified (GM) adult male mosquitoes. The GM mosquitoes carried a gene from bacteria. The gene causes the death of offspring before they become adults/sexually mature. Since one male mate with many females, this allele is carried to many eggs. Anopheles mosquitoes causing malaria die out without the use of insecticide. As a result, scientists are considering releasing millions of adult male GM mosquitoes into the wild which might help in the fight against malaria.

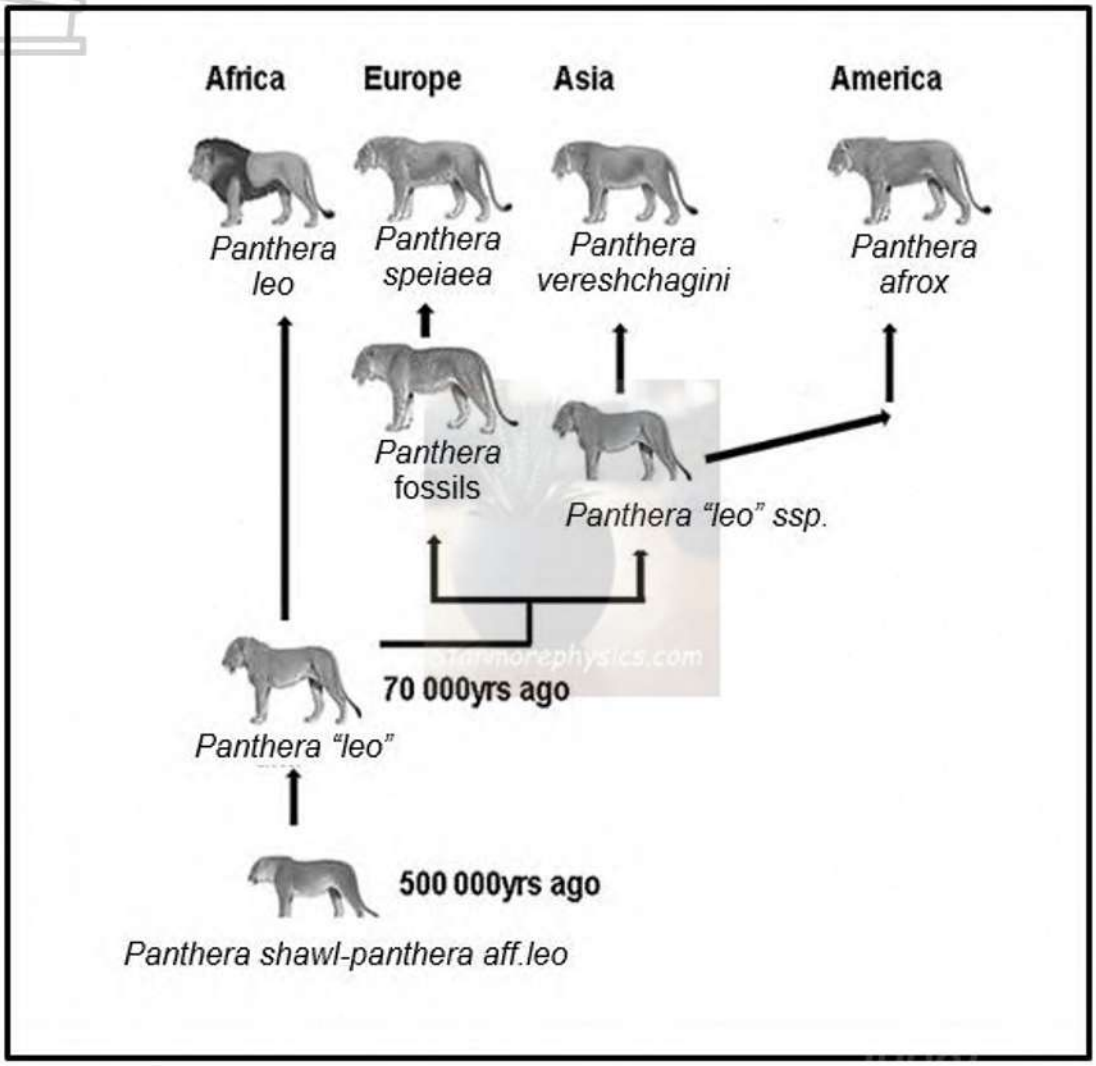
3.2.1 Describe how the scientists produced the genetically modified adult male mosquitoes. (3)

3.2.2 Suggest ONE advantage of creating the GM adult male mosquitoes. (1)

3.2.3 Describe ONE way in which the process of cloning is different from genetic engineering. (2)
(6)

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3.3 Scientists have conducted studies into the DNA of lions to reveal the evolutionary history of living and extinct lion species.
The study concluded that extinct and modern lions shared an ancestor some 500 000 years ago and that the main lineages of modern lions diverged some 70 000 years ago.



3.3.1 Name the super continent the common ancestors *Panthera shawl* and *Panthera leo* lived on. (1)

3.3.2 Explain the formation of all modern lion species from the common ancestor *Panthera "leo".* (7)
(8)

3.4 Orchid flowers are full of tricks to attract insects. Some resemble the shape and even pheromone smell of a female insect to attract the male insects. When they try to mate with this "female" they get covered in pollen.



Bee orchid petal resembling a female bee

3.4.1 Identify the reproductive isolating mechanism used by this orchid above. (1)

3.4.2 State TWO other reproductive isolating mechanisms used by organisms to ensure successful reproduction. (2)

3.4.3 Orchids sometimes needs to evolve quickly to match evolution of the insects they want to attract to make sure their "tricks" are efficient.

Which evolutionary theory best describes this phenomenon? (1)

3.4.4 Describe the theory named in QUESTION 3.4.3 (2)
(6)

3.5 Attention deficit hyperactivity disorder (ADHD) may have evolved in hunter-gatherer societies because it was advantageous for foragers (people gathering plant material for food). Traits that are commonly associated with the condition, such as impulsivity, might have encouraged some foragers to move on from areas with decreasing resources to areas with more resources sooner than those without the condition.

- 506 people were recruited to play an online foraging game. 43% of participants had ADHD symptoms.
- The players were instructed to collect as many berries as they could in 8 minutes by hovering their mouse cursor over bushes.
- They were given the choice to either stay at a bush or to try their luck by leaving for another, which may have more or fewer berries. Moving to a new bush caused them to lose time, so the players had to balance the benefits of potentially getting more berries with the time lost due to moving on.
- Those with ADHD symptoms spent about 4 seconds less hovering over any given bush compared with those without signs of the condition, which resulted in the ADHD group collecting an average of 602 berries compared with 521.

3.5.1 Design an investigative question for this simulation. (2)

3.5.2 Name TWO planning steps with regards to the participants for this investigation. (2)

3.5.3 Calculate the number of participants showing ADHD symptoms. (2)

3.5.4 Draw a table to record the results obtained. (5)

3.5.5 Identify the type of graph best suited to represent the given data. (1)

(12)

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3.6 November 2024 marked the 50-year anniversary of the discovery of the fossil known as Lucy. She was about three-million-years old with a small body and brain but were able to walk upright. They also found that she had wisdom teeth in her jaw which meant she was an adult despite her small size.

3.6.1 To which specie does Lucy belong? (2)

3.6.2 In which region was Lucy found? (1)

3.6.3 What is the term used for the ability to walk upright? (1)

3.6.4 Lucy was the most complete fossilized skeleton found at that time. List THREE features you would expect to find in her skeleton causing scientist to conclude that she walked upright. (3)

3.6.5 After Lucy there were many more species found with the ability to walk upright. Give the scientific name of the species that directly translates to "upright man". (1)
(8)
[50]

TOTAL SECTION B: 100
GRAND TOTAL: 150

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