LIMPOPO

PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
EDUCATION

NATIONAL

SENIOR CERTIFICATE

GRADE 12

Stanmorephysics.com

LIFE SCIENCES P2

TRIAL EXAMINATION

SEPTEMBER 2025

MARKS: 150

Time: 2½hours

This question paper consists of 17 pages including the cover page

Copyright reserved

NSC

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

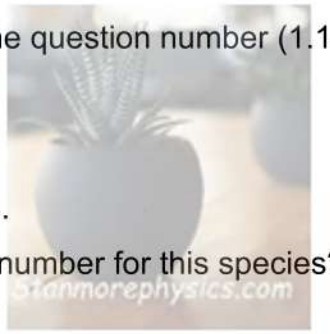
1. Answer ALL the questions.
2. Write ALL the answers in your ANSWER BOOK.
3. Start the answers to each question at the top of a NEW page.
4. Number the answers correctly according to the numbering system used in this question paper.
5. Present your answers according to the instructions of each question.
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 must use a non-programmable calculator, protractor and a compass.
11. Write neatly and legibly.

Copyright reserved

SECTION A

QUESTION 1

1.1. Various options are provided as possible answers to the following. Choose the correct answer and write only the letter (A – D) next to the question number (1.1.1 to 1.1.10) in the ANSWER BOOK, for example 1.1.11.D



1.1.1. A plant species has a diploid chromosome number of 24.

Which ONE of the following is the haploid chromosome number for this species?

A 48

B 12

C 6

D 36

1.1.2. A segment of DNA contains:

- 35% of adenine in strand 1
- 10% of cytosine in strand 2
- 25% of guanine in strand 2

In this segment of DNA, there will also be…

A 35% of adenine in strand 2

B 10% of cytosine in strand 1

C 35% of thymine in strand 2

D 25% of cytosine in strand 2

1.1.3. When a cell divides by meiosis it results in …

A Four haploid gametes.

B Two diploid gametes.

C Four haploid somatic cells.

D Two haploid somatic cells.

Copyright reserved

1.1.4. An individual is heterozygous for a harmful recessive allele but unaffected by it.

Which one of the following best represents the genetic composition of this individual?

A One harmful recessive allele and one harmful dominant allele.
B Two dominant harmless alleles.
C One harmful dominant allele and one harmless recessive allele
D One harmful recessive allele and one harmless dominant allele.



1.1.5. The insulin molecule contains 54 amino acids.

How many mRNA nucleotides code for this insulin molecule?

A 54
B 18
C 162
D 153

1.1.6. During which stage of meiosis do spindle fibers begin to form?

A Interphase
B Prophase
C Metaphase
D Telophase

1.1.7. The following are characteristics of a group of animals:

(i) Able to interbreed
(ii) Occupy the same habitat
(iii) Produce infertile offspring
(iv) Belong to the same species

Which combination CORRECTLY represents a population?

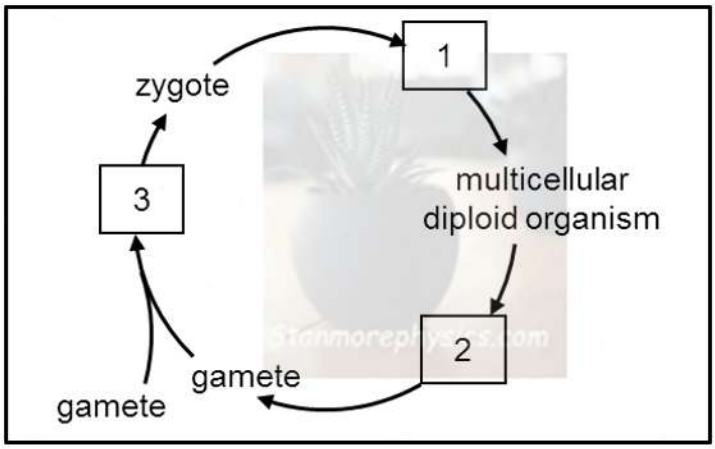
A (i), (ii), (iii) and (iv)
B Only (i), (ii) and (iv)
C Only (i), (ii) and (iii)
D Only (i) and (iv)

Copyright reserved

1.1.8. The following represents the most significant evolutionary change in the development of *Homo sapiens*?

A Loss of body hair.
B Shortening of the jaws.
C Shorter legs.
D The increase in brain size.

1.1.9. Use the sketch below to identify processes 1, 2 and 3.



	1	2	3
A	meiosis	fertilisation	mitosis
B	fertilisation	mitosis	meiosis
C	mitosis	meiosis	fertilisation
D	fertilisation	meiosis	mitosis

1.1.10. Which ONE of the following statements is CORRECT for the 'Out of Africa' hypothesis?

A All modern humans evolved from African apes and then migrated to other parts of the world.
B An analysis of mutations on the mitochondrial DNA shows that the oldest male ancestors were found in Africa.
C The youngest fossils of *Homo erectus* were found in Africa only.
D All modern humans originated in Africa and migrated to other continents.

(10x2) **(20)**

Copyright reserved

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 1.2.9) in your ANSWER BOOK.

1.2.1. The phase of meiosis where the two chromosomes of each homologous pair are pulled to the opposite poles.

1.2.2. A genetic cross in which both alleles are equally expressed in the phenotype.

1.2.3. An opening on primate skulls through which the spinal cord passes.

1.2.4. The process during which a DNA molecule makes an exact copy of itself.

1.2.5. A testable statement that may be accepted or rejected.

1.2.6. An alteration of genetic make-up of an organism so that it fulfillls some human needs

1.2.7. The external appearance of an individual determined by the DNA in the gene that influences a particular characteristic.

1.2.8. A diagrammatic representation showing the probable evolutionary relationship amongst different organisms

1.2.9. Triplets of bases found in a transfer RNA molecule

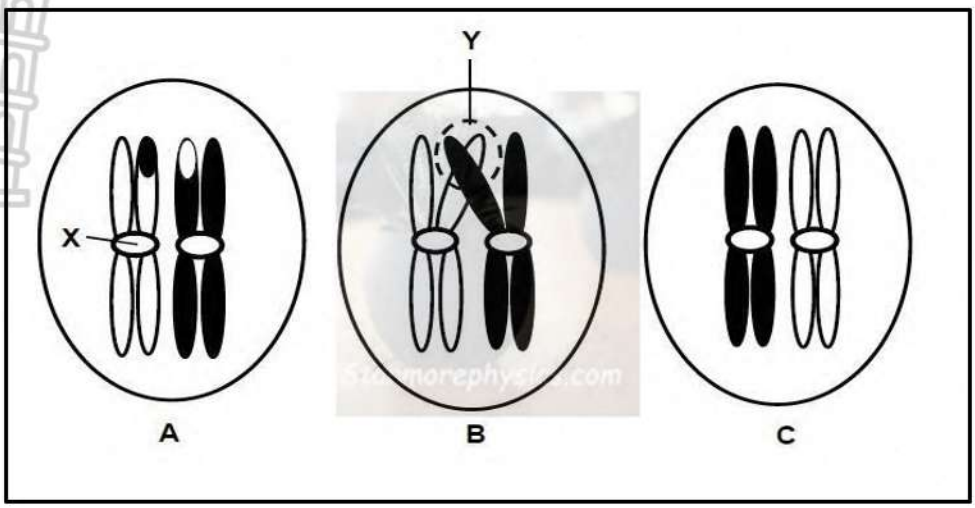
(9 x 1) **(9)**

1.3. Indicate whether each of the statements in COLUMN I applies 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.	Contains the sugar deoxyribose	A: RNA B: DNA
1.3.2.	Humans select characteristics when breeding organisms.	A: Artificial selection B: Natural selection
1.3.3.	Proposed the ideas of use and disuse, and the inheritance of modified characteristics to explain evolution	A: de Lamarck B: Charles Darwin

(3x2) **(6)**

1.4. The diagrams below represent a chromosome pair in a female human cell. The cells (**A**, **B** and **C**) show different events in a phase of meiosis, which are not necessarily in the correct sequence.



1.4.1 Give labels for:

a) Region X (1)

b) Area Y (1)

1.4.2. Name the organ in the human female where meiosis occurs. (1)

1.4.3. Name the:

a) Process occurring in diagram B (1)

b) Phase represented by the diagrams above. (1)

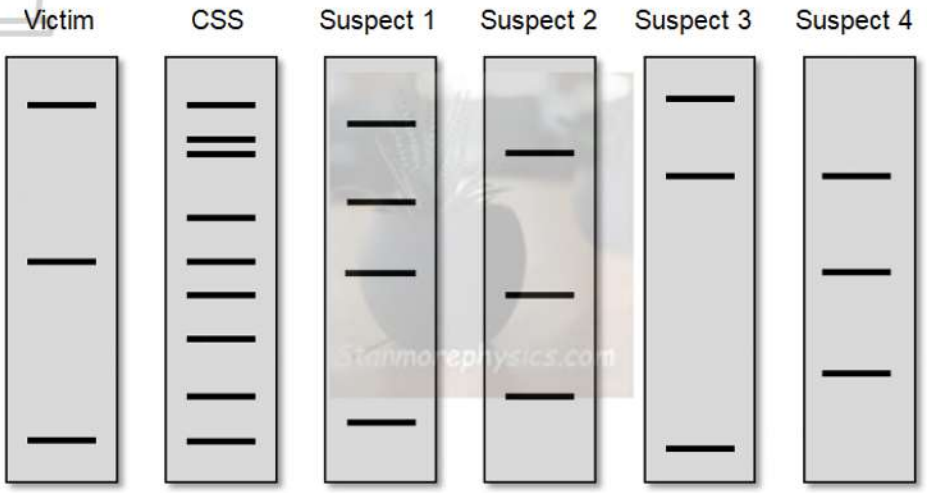
1.4.4. Arrange letters **A, B** and **C** to show the correct sequence of the events. (1)

1.4.5. State three reasons why meiosis is biologically important. (3)

1.5 Give three similarities between mitosis and meiosis (3)

(12)

1.6 In a fight involving a number of people, one person was seriously injured. Police took blood samples from the victim, the crime scene (CSS – crime scene sample) and four suspects. The DNA was then extracted from each sample. The results are shown in the DNA profiles below



1.6.1 Which suspect probably injured the victim? (1)

1.6.2 Name two uses of DNA profiling other than for solving crime. (2)

(3)

TOTAL SECTION A: [50]

SECTION B

QUESTION 2

2.1. The table below shows a partial DNA sequence from a human, as well as a codon table that can be used to determine which amino acids are required to make a protein.

Base triplet number	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Human DNA sequence	**ATG**	**TGT**	**CCA**	**TTA**	**ACG**	**TGC**	**ACA**

CODON TABLE	
Cysteine	**UGU, UGC**
Threonine	**ACG,ACA**
Tyrosine	**UAC,UAU**

2.1.1 State ONE way in which the DNA molecule is biologically important. (1)

2.1.2 Name the codon that is formed from base triplet **number 2** on the DNA sequence. (1)

2.1.3 Write down the names of the amino acids coded for by base triplets **6** and **7.** (2)

2.1.4 If a mutation changes base triplet **1** from ATG to ATA, why will this not change the protein formed? (2)

2.2 Describe the process of translation in protein synthesis. (5)

2.3 Tabulate the difference in the sugar component of RNA and DNA. (3)
(14)

2.4 Brachydactyly is a genetic condition characterized by unusually short fingers. The allele for short fingers is represented by **B**, it is dominant over the allele for normal fingers (**b**). The allele for curly hair (**H**) is dominant over the allele for straight hair (**h**).

Fanie, with genotype **BBhh**, married Rose, with genotype **bbHh**.

2.4.1 State how the phenotypes of Fanie and Rose differ from each other. (2)

2.4.2 Give ALL the possible genotypes of the gametes produced by Rose. (2)

2.4.3 Explain how Mendel's Law of Independent Assortment applies to parents with BbHh genotypes during gamete formation. (4)

(8)

2.5 Mr. and Mrs. Mashilo are concerned that their baby girl does not appear to resemble either of them. They suspect that the baby they were given at the hospital was not theirs. Mr. Mashilo is blood type **AB**, Mrs. Mashilo is blood type **B** and the baby they were given is blood type **O**.

2.5.1 Give the possible genotypes of:

(a) Mrs. Mashilo (2)

(b) The baby girl (2)

2.5.2 Which 2 alleles are co-dominant in the inheritance of blood groups? (2)

2.5.3 Explain why the baby girl with blood type O cannot be Mr. and Mrs. Mashilo's daughter. (3)

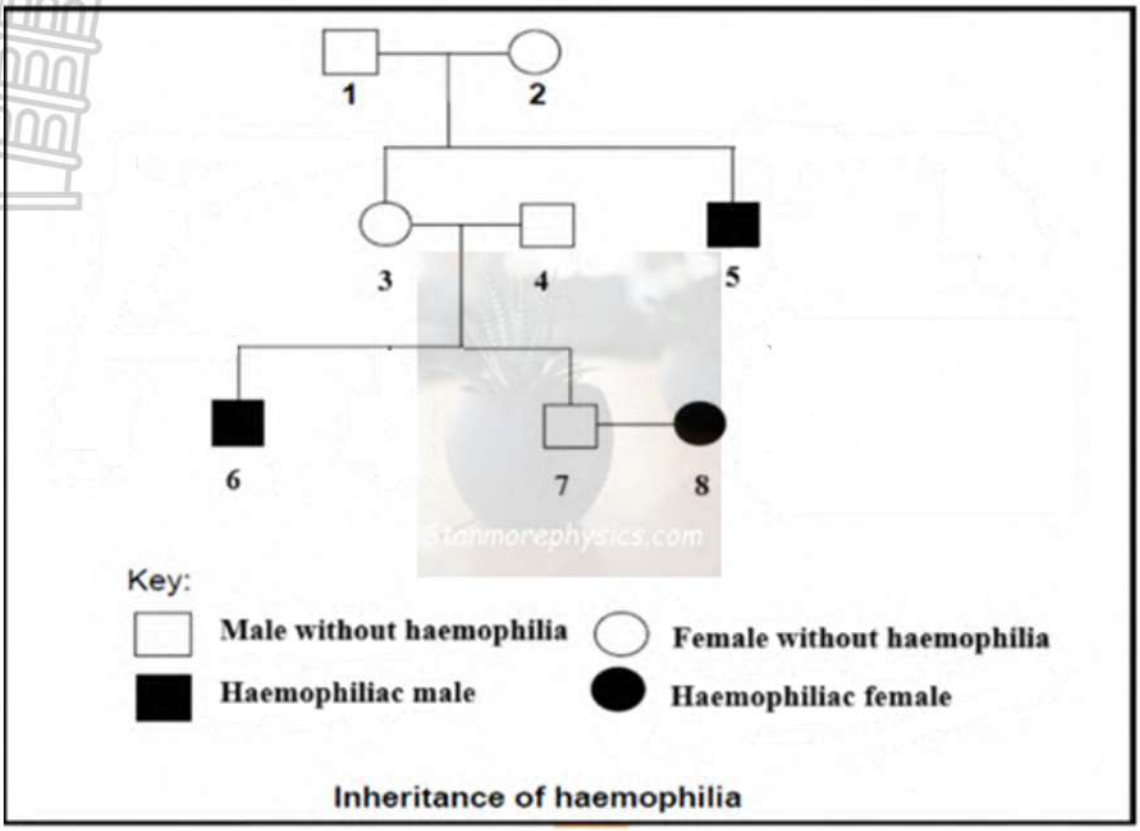
2.5.4 Explain why the use of blood type for paternity testing is not conclusive. (2)

2.6 Using your knowledge of sex chromosomes, explain why the sex of a child is determined by the male gamete. (5)

(16)

Copyright reserved

2.7 The pedigree diagram below shows the inheritance of *haemophilia* in a family. The allele causing *haemophilia* is represented by X^h and the allele without is represented by X^H.



Inheritance of haemophilia

2.7.1 State the:

(a) Phenotype of individual 3. (1)

(b) Genotype of individual 2. (1)

2.7.2 Explain why females have a smaller chance of suffering from *Haemophilia*. (3)

2.7.3 Use a genetic cross to show the percentage chance of individuals **7** and **8** having a *haemophiliac* son. (7)

(12)

TOTAL SECTION B: [50]

QUESTION 3

3.1 Pathogens develop resistant to drugs and pesticides because some of the pathogens are naturally resistant to the drugs. When the drugs kill the non-resistant pathogens, only the resistant pathogens remain, resulting in a population of pathogens that cannot be killed by conventional drugs or pesticides.

3.1.1 What does it mean when we say that some pathogens are "naturally resistant" to drugs or pesticides? (1)

3.1.2 In simple terms, explain how using drugs or pesticides can lead to a group of pathogens that are all resistant to treatment according to Charles Darwin (3)

(4)

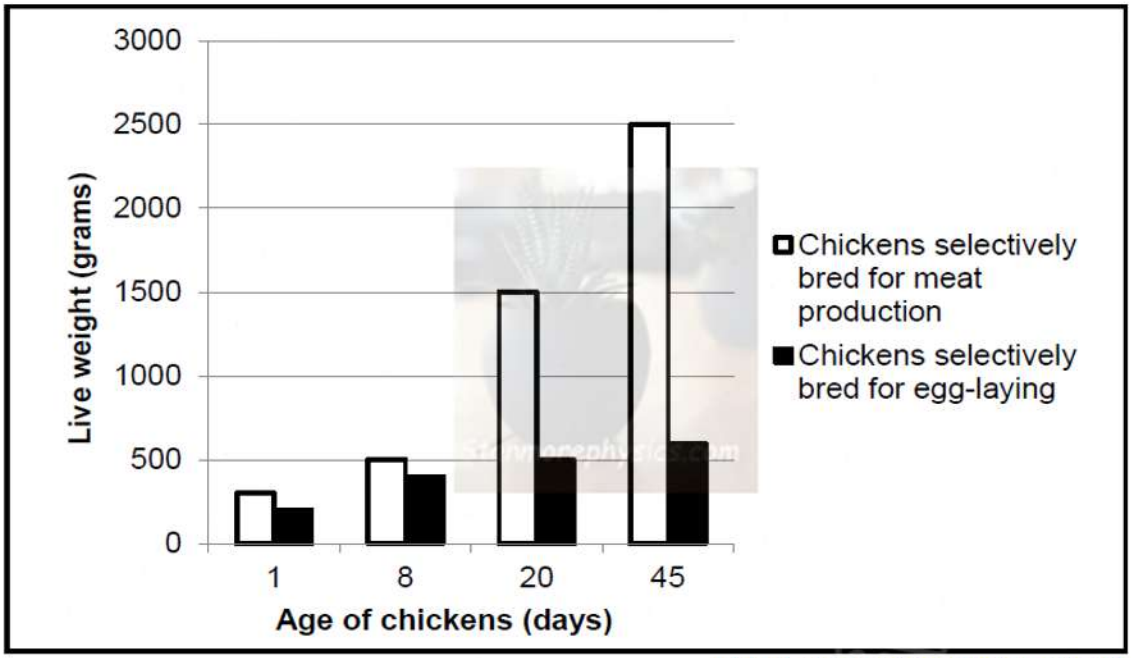
stanmorephysics.com

3.2 An investigation was done by Grade 12 learners to determine which chickens grow faster: chickens that are selectively bred for laying eggs or chickens that are selectively bred for meat production.
The following steps were carried out:

1. The learners bought thirty "one -day-old" chickens from a commercial supplier. Fifteen(15) of the chickens had been selectively bred for laying eggs and fifteen(15) of the chickens had been selectively bred for meat production.
2. All the chickens were kept under the same environmental conditions. This included being fed the same chicken feed, made mostly from cereal grains and protein sources.
3. The chickens were weighed regularly for a period of 45 days.

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

Growth Comparison of Chickens Egg-Laying vs Meat Production Breeds Over Time



[Adapted from www.chicken.org.au]

3.2.1 What is a possible conclusion you might derive from this investigation? (2)

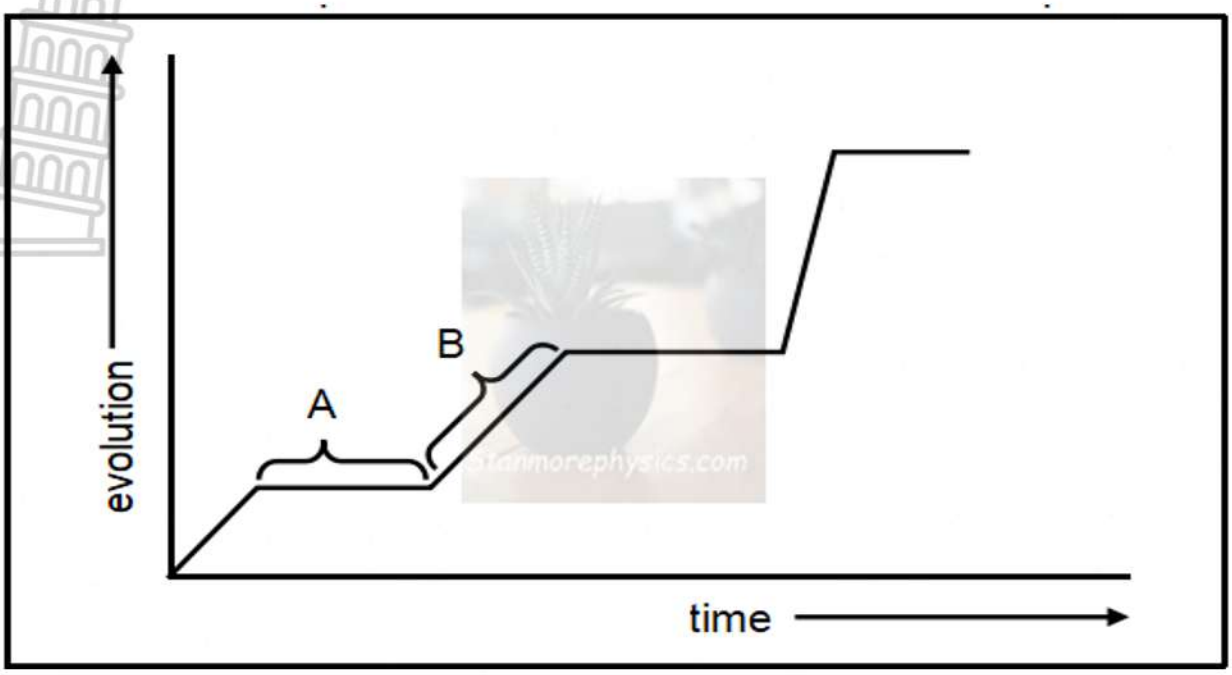
3.2.2 Identify the:
(a) Independent variable (1)
(b) Dependent variable (1)

3.2.3 State one factor that should be kept constant. (1)

3.2.4 Calculate the percentage weight increase of the chickens that were selectively bred for meat between **day 8 and day 45**. Show ALL working. (2)

3.2.5 State one advantage of repeating the investigation with 100 chickens. (2)
(9)

3.3 The graph below shows the speed at which evolution occurs in a species of butterfly.



3.3.1 Explain the trend in evolution represented by:

(a) Phase A (2)

(b) Phase B (2)

3.3.2 In view of the trend represented by A and B, what type of evolution is represented by the graph? (1)

3.3.3 Explain why the chances of speciation are great during phase B (2)

(7)

3.4 Read the passage below

NEW HOMINI SPECIES DISCOVERED

On 13 September 2013 scientists discovered fossils in the Sterkfontein Caves in South Africa which appeared to belong to a previously unknown species of hominins.

The fossils were classified as a new species, *Homo naledi*. The physical characteistics of *H.naledi* are described as having traits similar to the genus *Australopithecus*, mixed with traits more characteristic of the genus *Homo*. It appeared that *H.naledi* represented a transitional fossil

An analysis of *H. naledi`s* skeleton suggests that it stood upright and was bipedal. The structure of the pelvis is similar to the genus *Homo*.

The teeth are much smaller than those of the *Autralopithecus* and similar to the teeth of modern humans

[Adapted from https: humanorigins.si.edu/evidence]

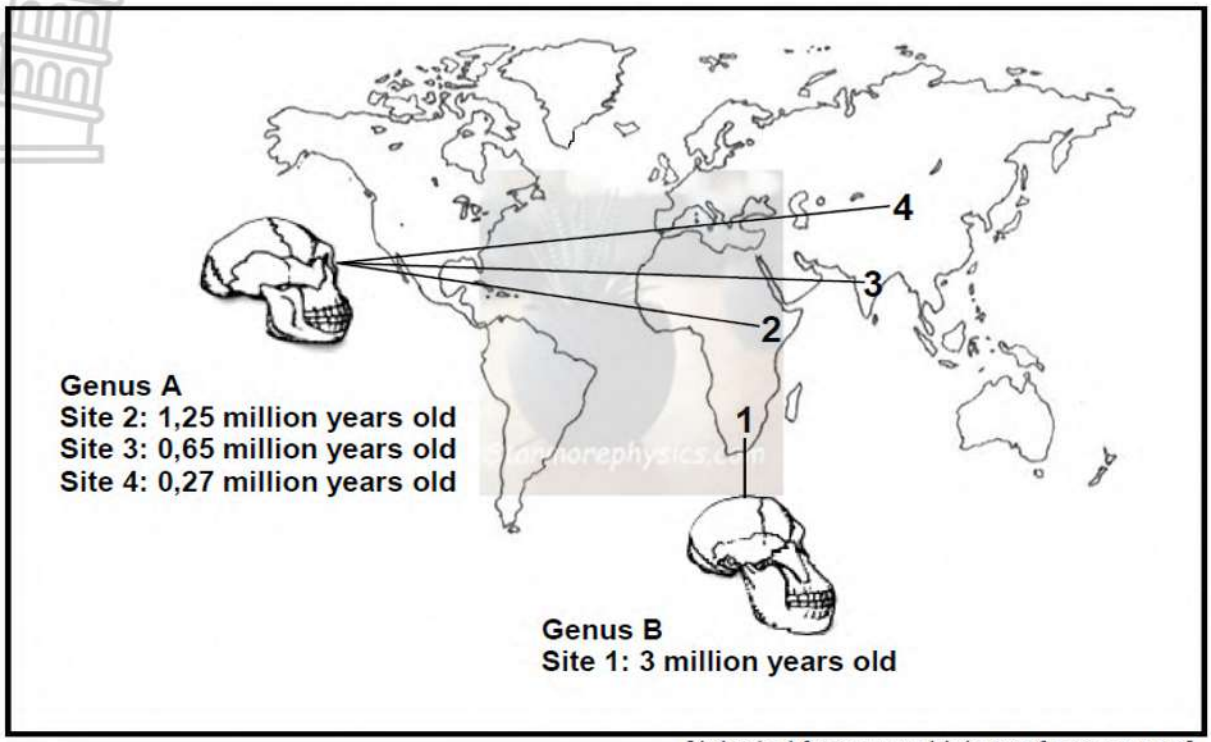
3.4.1 Define the term "transitional fossil". (2)

3.4.2 Explain THREE characteristics of a skeleton which are adaptations for bipedalism. (6)

3.4.3 Give possible reasons why there was a change to smaller teeth in modern humans. (3)

(11)

3.5 The diagram below shows a world map indicating four sites (1 to 4) where hominid fossils, representing two different genera, have been found. Genus A was found at three sites and genus B at one site. The age of each fossil was determined using radiometric dating.



[Adapted from www.biologyreference.com]

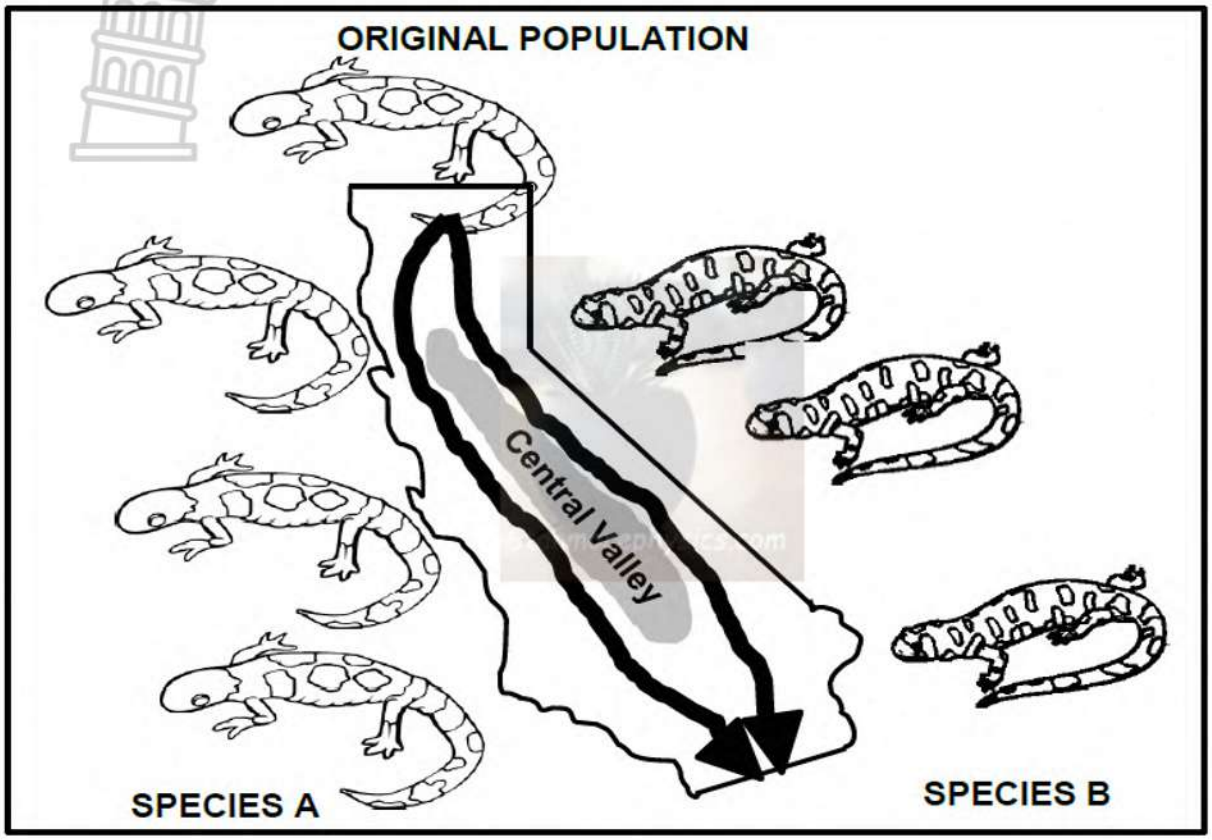
3.5.1 Which genus (A or B): Represents *Australopithecus.* (1)

3.5.2 Name TWO examples of fossils of genus B found at site 1 in South Africa. (2)

3.5.3 At which site, 1 to 4, were the youngest fossils found? (1)

3.5.4 Other than fossil evidence, what other evidence can be used to support the "Out of Africa hypothesis"? (2)
(6)

3.6 The diagram below shows an evolutionary process taking place in a population of salamanders in California. The process took place gradually, millions of years ago. Study the diagram and answer the questions that follow.



3.6.1 Define what biological species is? (3)

3.6.2 Name and describe the process in the diagram above? (6)

3.6.3 Discuss how national selection could lead to the development of different traits in two isolated populations of the same species living in different environments. (4)

(13)

(50)

TOTAL SECTION B: 100
GRAND TOTAL: 150

Copyright reserved