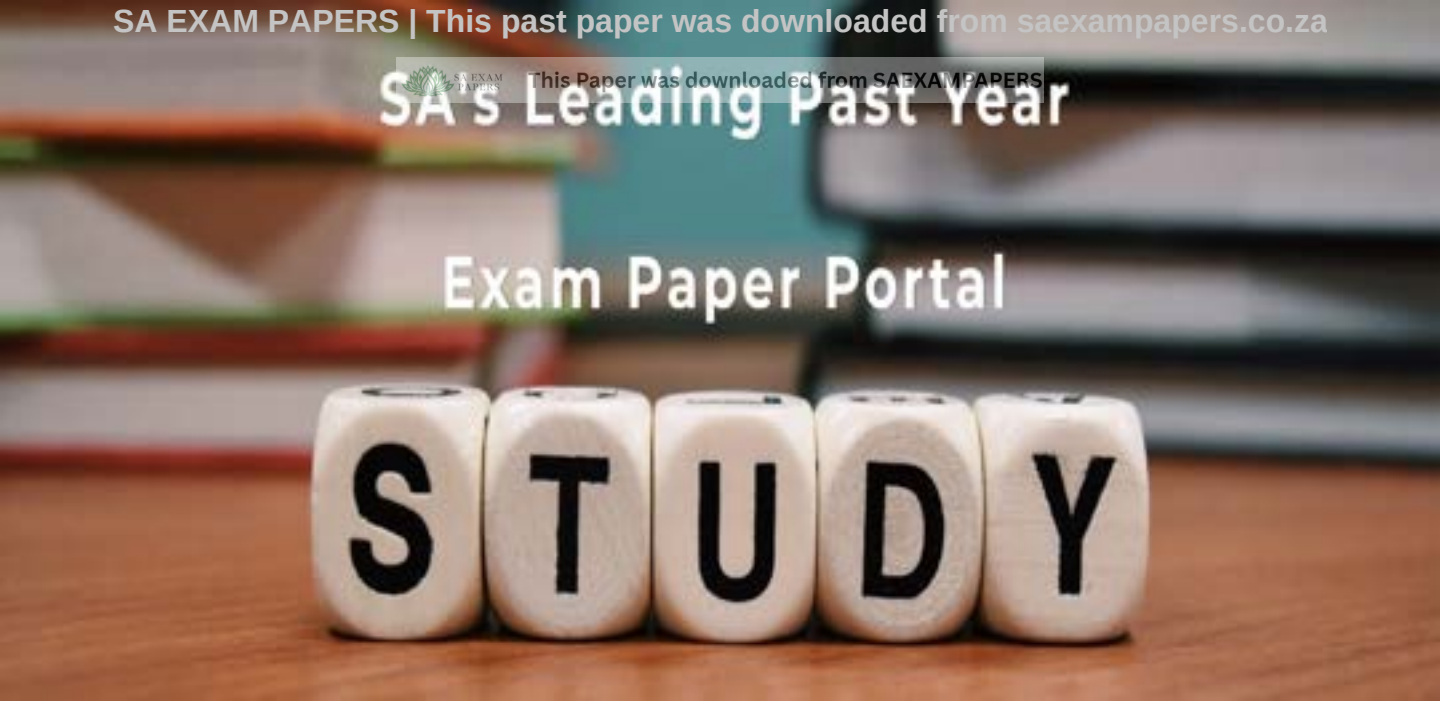


KWAZULU-NATAL PROVINCE

EDUCATION
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES P2

PREPARATORY EXAMINATION

SEPTEMBER 2025

MARKS: 150

TIME: 2½ hour

This question paper consists of 16 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 may use a non-programmable calculator, protractor and a compass.
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 to D) next to the question number (1.1.1 to 1.1.9) in the ANSWER BOOK, for example 1.1.10 D.

1.1.1 Sources of variation in a human population are ...

A mutation, mitosis, random mating and random fertilisation.
B replication, random mating, meiosis and mitosis.
C mutation, meiosis, random fertilisation and random mating.
D random mating, replication, random fertilisation and meiosis.

1.1.2 Meiosis is a significant type of cell division, as it is responsible for the ...

A production of genetically identical gametes.
B doubling the chromosome number from generation to generation.
C production of haploid gametes.
D production of diploid gametes.

1.1.3 A portion of DNA molecule has 140 guanine and 70 thymine nitrogenous bases.

What is the total of deoxyribose sugars in this portion of DNA molecule?

A 420
B 210
C 140
D 70

1.1.4 A homozygous purple flowering plant **(P)** is crossed with a pink flowering plant **(p)** to produce the F1-generation. One of the F1 generation offspring is crossed with a pink flowering plant to produce the F2-generation offspring.

Which ONE of the following is the CORRECT phenotypic ratio of the F2-generation?

A **1** purple flowering plant: **1** pink flowering plant
B **1** purple flowering plant: **3** pink flowering plant
C **3** purple flowering plant: **1** pink flowering plant
D **1** purple flowering plant: **2** pink flowering plant

1.1.5 Which of the following genotypes is possible in the offspring of a homozygous male with blood group **A** and a female with blood group **B**?

A I^AI^A
B I^Ai
C ii
D I^Bi

1.1.6 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 species-specific courtship behavior.
C infertile offspring.
D prevention of fertilization.

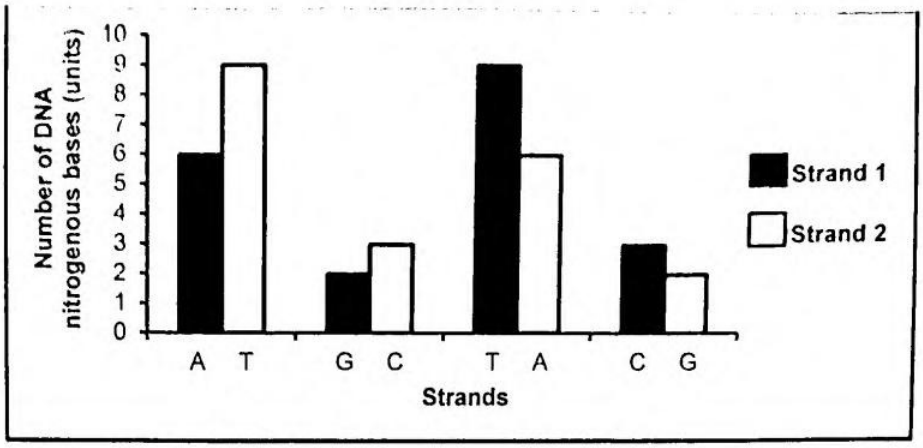
1.1.7 Below is a list of statements in human evolution.

(i) Australopithecus fossils were found in Africa only
(ii) *Homo habilis* fossils were found in Africa only
(iii) *Homo sapiens* fossils were found in Africa only
(iv) The oldest *Homo erectus* fossil was found in Africa

Which ONE of the following combinations is the CORRECT fossil evidence for the "Out of Africa hypothesis"?

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

1.1.8 The graph below shows a portion of DNA molecule containing 20 nitrogenous bases in each strand.



The **strand 2** was used as a template for the formation of mRNA during protein synthesis.

The percentage difference between **uracil** and **adenine** on the mRNA strand is ...

A 30
B 20
C 15
D 0

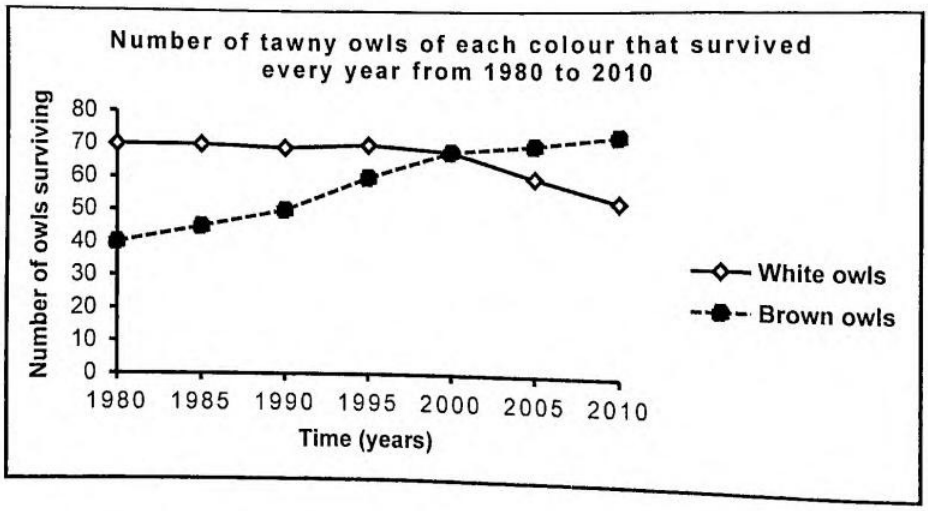
1.1.9 There is variation in tawny owls. Some are white and others are brown in colour.

Scientists studied these owls over a period of 30 years, from 1980 to 2010, to determine the effect of climate change that caused increasing global temperatures with less snow each year.

The scientists:

- Conducted the investigation over the same four months of winter each year.
- Observed the same population of tawny owls each year.
- Determine the number of tawny owls of each colour that survived every year.

The results are shown in the graph below:



What conclusion can be made about the suitability of each colour owl to survive in more snow?

A The brown owls are less suited to survive than the white owls
B The white owls are less suited to survive than the brown owls
C Both brown and white owls are equally suited to survive
D The brown owls are more suited to survive than the white owls

(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 number (1.2.1 to 1.2.9) in the ANSWER BOOK.

1.2.1 The number, shape and arrangement of all the chromosomes in the nucleus of a somatic cell

1.2.2 The opening in the base of the skull through which the spinal cord passes

1.2.3 The study of the distribution of living organisms found in different regions

1.2.4 The permeant disappearance of species from earth

1.2.5 An inherited disorder where blood fails to clot properly

1.2.6 Act or ability of using two feet for walking or locomotion

1.2.7 An organelle that is responsible for protein synthesis

1.2.8 The type of evolution characterised by long periods of little or no change followed by short periods of rapid change

1.2.9 A phase in the cell cycle where DNA replication occurs

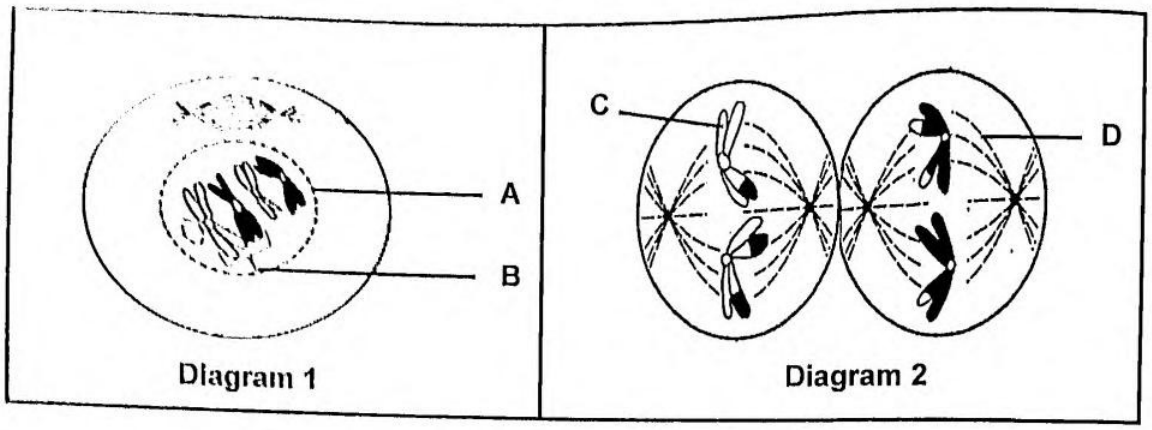
(9 × 1) **(9)**

1.3 Indicate whether each of the descriptions 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	A point where two chromatids overlap	A: Chiasma B: Locus
1.3.2	There is a range of different phenotypes for a particular characteristic	A: Continuous variation B: Discontinuous variation
1.3.3	Fossils found in South Africa	A: Little Foot B: Taung Child

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

1.4 The diagrams below represent a cell in two different phases of meiosis in no order.



1.4.1 Identify the phase of meiosis represented in diagram:

(a) **1** (1)

(b) **2** (1)

1.4.2 Give the LETTER and NAME of the part that:

(a) Disappears at the end of the phase in **diagram 1** (2)

(b) Pulls chromatids towards opposite poles (2)

1.4.3 Give the chromatid number for each cell in **diagram 2**. (1)

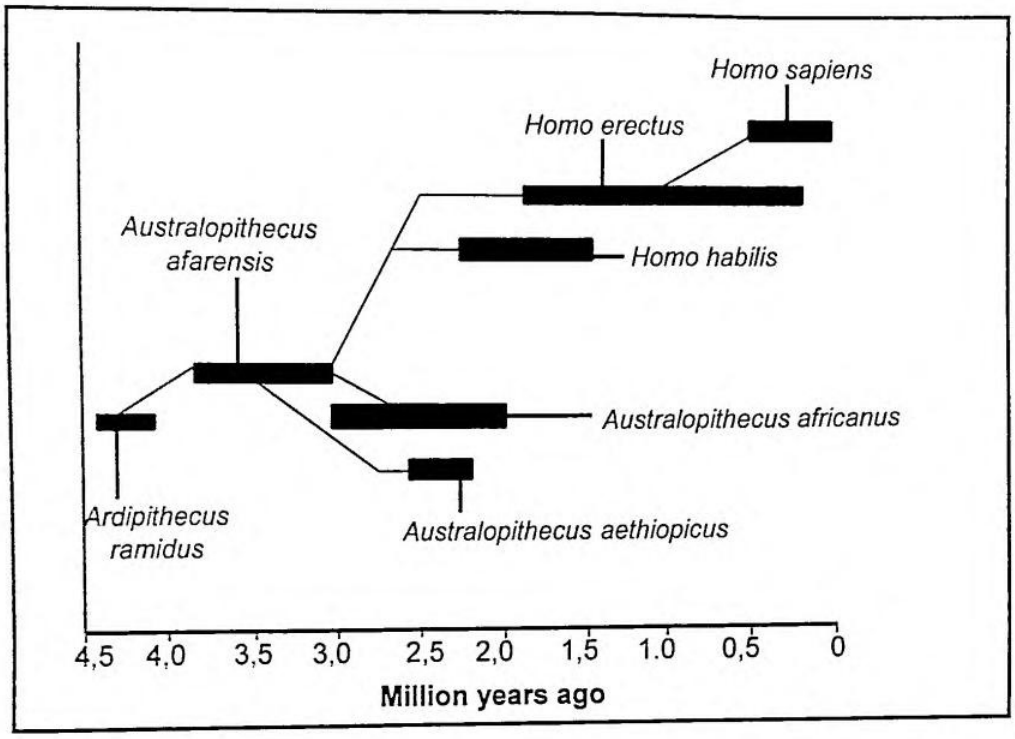
1.4.4 Name the:

(a) Process that caused the appearance of chromosomes in **diagram 2**. (1)

(b) Phase that follows the one shown in **diagram 1**. (1)

(c) Organ in the female body where the process of meiosis occurs. (1)
(10)

1.5 The diagram below illustrates the evolutionary relationships and shared ancestry.



1.5.1 Identify:

(a) The diagram shown above (1)

(b) TWO genera that existed between 2.5 and 1.5 million years ago (2)

1.5.2 When did *Homo habilis* become extinct? (1)

1.5.3 How many million years did *Australopithecus africanus* live? (1)

1.5.4 Name the:

(a) Most recent ancestor of the *Homo habilis* (1)

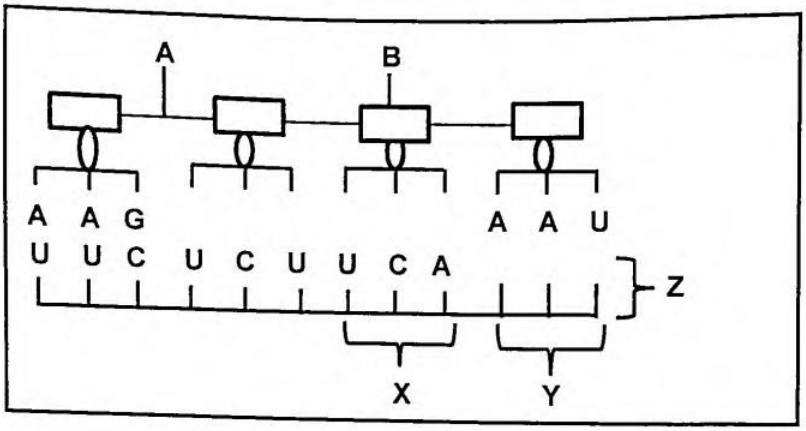
(b) Family to which all the species in the diagram above belong (1)
(7)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 The diagram below shows part of the process involved in protein synthesis.



2.1.1 Name the stage of protein synthesis that is shown in the diagram. (1)

2.1.2 Identify:

(a) **A** (1)

(b) **B** (1)

2.1.3 Give the:

(a) Give the collective name of nitrogenous bases **X** (1)

(b) DNA base triplet that code for **Y** (1)

2.1.4 The table below shows amino acids and DNA triplet base.

AMINO ACIDS	DNA TRIPLET BASE
Leucine	AGT
Glycine	AAG
Glutamic Acid	AAT
Proline	AGA

With reference to the diagram and the table above:

(a) Write down the codon that codes for proline (1)

(b) Name the last TWO amino acids coded for by molecule **Z** in the diagram (from left to right) (2)

(8)

2.2 Describe the process of *transcription*. **(6)**

2.3 Read the passage below.

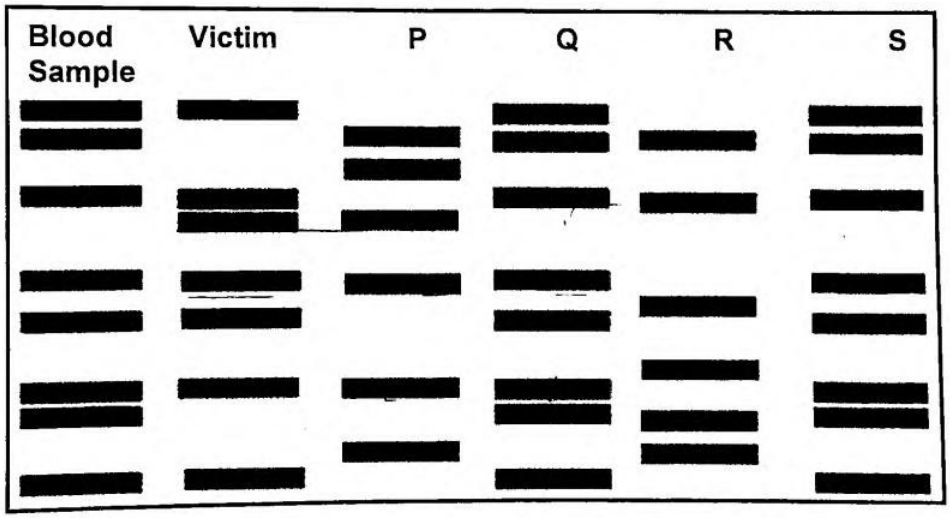
> Komodo dragon and Timor monitor are two different types of monitor lizards. They evolved from a population of the common ancestor and adapted in different islands over time. These different species of monitor lizards show differences in body size and diet.
>
> Komodo dragon have a larger body size than the Timor monitor. Komodo dragon feeds on larger prey such as deer and pigs, whereas Timor monitor feeds on small prey such as inserts.

2.3.1 Define the term *population*. (2)

2.3.2 From the passage, name the species that feeds on insects. (1)

2.3.3 Describe how the Komodo dragon and Timor monitor could have evolved from a common ancestor. (6) **(9)**

2.4 The diagram below shows the DNA profile of blood sample found in a crime scene, victim and suspect **P, Q, R** and **S**.



2.4.1 State the conclusion that can be drawn from the analysis in the DNA profiles of **Q** and **S**. (2)

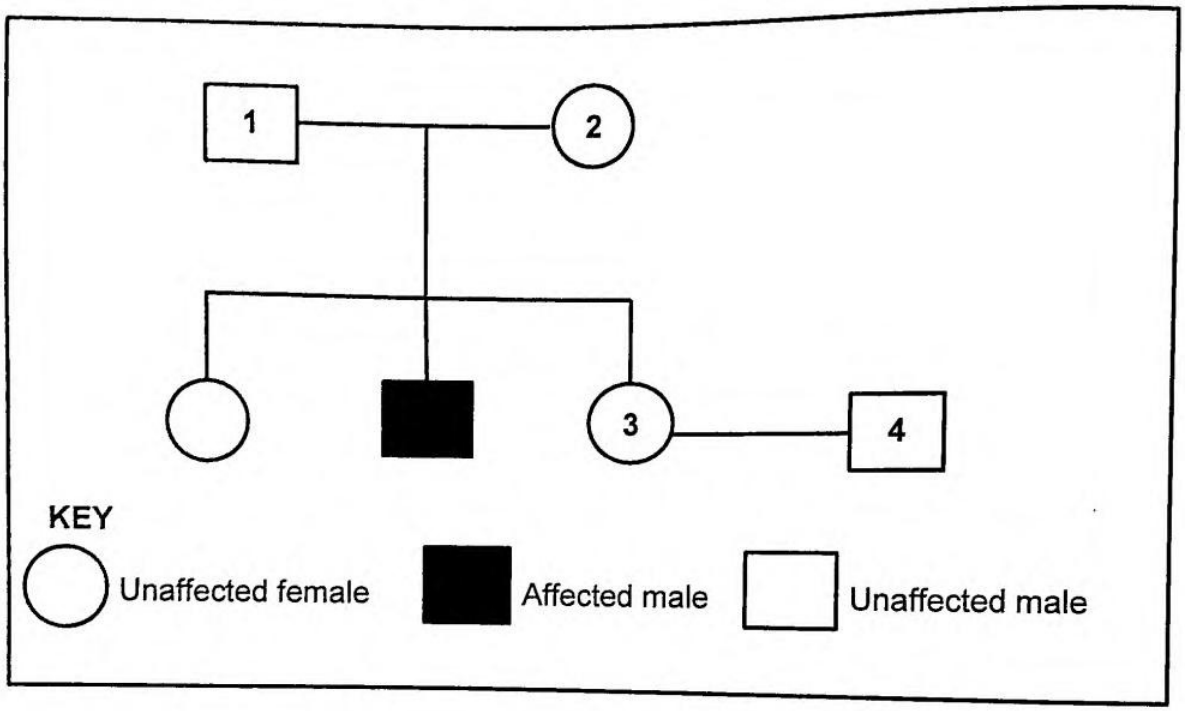
2.4.2 Give TWO reasons why DNA profiling does not always provide a conclusive evidence in criminal investigations. (2)

2.4.3 State TWO benefits of using DNA profiling other than that of solving crimes. (2)

2.4.4 Explain why DNA profiling is a reliable method for identifying suspects in criminal investigation. (2) **(8)**

2.5 Fabry disease is a sex-linked disorder that affects kidney, heart, brain and skin. A recessive allele X^b causes Fabry disease in humans.

The pedigree diagram below shows the inheritance of Fabry disease in a family.



2.5.1 How many generations are represented in the pedigree above? (1)

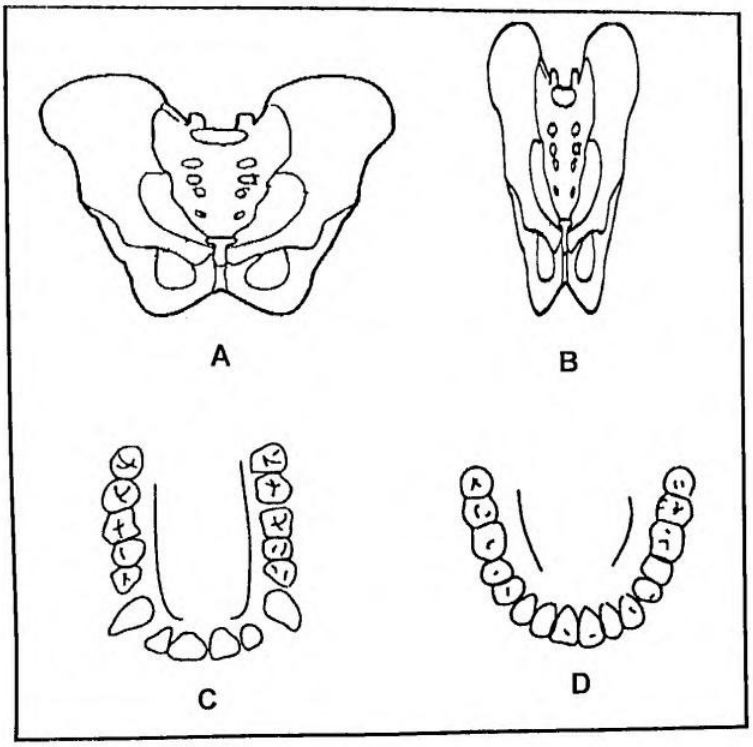
2.5.2 Give the genotype of individual **2**. (1)

2.5.3 Explain why males are most likely to be affected by Fabry disease. (3)

2.5.4 Individual **3** is heterozygous and is planning to have a child with her husband (individual **4**).

Use a genetic cross to show ALL the possible phenotypes of the offspring. (6)
(11)

2.6 The diagrams below show the parts of Homo sapiens and Chimpanzee.



2.6.1 Write down the LETTER of the diagram that represents the pelvic structure of a quadrupedal organism. (1)

2.6.2 Tabulate TWO visible differences between jaw **C** and **D** which shows trend in human evolution. (5)

2.6.3 Explain the significance of the change in pelvis from **B** to **A**. (2)

(8)

[50

QUESTION 3

3.1 Read the passage below.

> Stem cell transplants are used to treat cancers that affect the blood and immune system such as lymphoma and leukaemia. It replaces the cells damaged by chemotherapy. The treatment uses stem cells from embryos and bone marrow of adult tissues to restore healthy blood cell production.

3.1.1 From the passage, give:

(a) TWO sources where stem cells can be collected (2)

(b) TWO types of cancer that can be treated using stem cells (2)

3.1.2 Stem cells from bone marrow of an adult can be used to replace cells that are damaged by chemotherapy.

Explain why stem cells are used in replacing these damaged cells. (2)
(6)

3.2 Read the passage below.

> During the Industrial Revolution in England, pollution from factories blackened trees with soot, leading to a shift in the peppered moth population from primarily light -coloured to dark-coloured because the dark moths were better camouflaged against the darkened bark and were thus less likely to be preyed upon by birds.

3.2.1 Explain why the population of dark- coloured moth increased after the Industrial Revolution in England using:

(a) Lamarckism (6)

(b) Darwinism (7)
(13)

3.3 A farmer collected 20 fish species (yellow fish and blue fish) with similar characteristics.

An investigation was carried out to determine the dominant colour in these species of fish.

The procedure was as follows:

- Healthy yellow fish and blue fish were selected.
- 10 fish species belonged to yellow fish and another 10 to blue fish.
- Each fish species consisted of 2 male fish.
- All fish species were of the same reproductive age.
- These fish species were bred for five years.
- 100 offspring were collected each year to observe the dominant colours.

The table below shows the average results of the offspring.

PHENOTYPE	AVERAGE NUMBER OF FISH OVER FIVE YEARS
Yellow	19
Green	65
Blue	16

3.3.1 Give TWO planning steps that would have been taken for this investigation. (2)

3.3.2 State TWO:

(a) Ways in which the reliability of this investigation was ensured (2)

(b) Ways in which the results of the investigation were made valid (2)

3.3.3 Name the type of dominance shown in this investigation. (1)

3.3.4 Give a reason for your answer in QUESTION 3.3.3. (2)

3.3.5 Based on the results shown in the table, explain why the green phenotype is more common than yellow and blue phenotype in the offspring. (2)

3.3.6 Draw a bar graph to show the average number of fish over five years for each phenotype given in the table above. (6)
(17)

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

3.5 In grape plants, red fruit colour **(R)** is dominant over green fruit colour **(r)**, and broad leaf **(B)** is dominant over narrow leaf **(b)**.

A grape plant that is heterozygous for both red fruit and broad leaf is crossed with a plant that is heterozygous for red fruit and narrow leaf.

The following table shows the results of the genetic cross between the two plants.

PHENOTYPE	NUMBER OF OFFSPRING
Red fruit and broad leaf	288
Green fruit and narrow leaf	108
Green fruit and broad leaf	96
Red fruit and narrow leaf	296

3.5.1 Identify the type of crossing referred to above. (1)

3.5.2 Give a reason for your answer in QUESTION 3.4.1. (1)

3.5.3 Give the:

(a) Genotypes of the parent plants that were crossed (2)

(b) Possible genotypes in the gametes of the heterozygous red fruit and narrow leaf (2)

(c) Phenotypic ratio of red fruit and broad leaf to green fruit and broad leaf (2)

3.5.4 Two grape plants that are homozygous for both characteristics were crossed.

How many grape plants in the next generation are likely to have green fruit and narrow leaf? (1)

(9)

[50]

TOTAL SECTION B: 100

GRAND TOTAL: 150