LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
EDUCATION

NATIONAL
SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES P2
SEPTEMBER 2021
QUESTION PAPER

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 answers in the ANSWER BOOK
3. Start the answers the 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, flow charts or tables 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 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 to 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 Below is a list of fossils discovered in South Africa:

1 Taung child
2 Little foot
3 Karabo
4 Mrs Ples

Which of the fossils above are classified as the species *Australopithecus africanus*?

A 1, 2 and 3
B 1, 2 and 4
C 2, 3 and 4
D 1, 3 and 4

1.1.2 Dikeledi has a child who has blood group B. There are three men who are claiming paternity of the child. Kagiso has blood group O, Thabo has blood group AB and Pule has blood group O.
Dikeledi's blood group is A.
Who is the possible father of Dikeledi's child?

A Pule
B Thabo
C Kagiso
D None of the above

1.1.3 According to Charles Darwin's theory, natural selection states that.....

A all life forms developed from a single spermatozoon.
B all quadrupeds got rid of inherited ancestral parts which were not used.
C advantageous characteristics enabled individuals to survive over weaker ones.
D new characteristics are obtained by use and disuse.

1.1.4 The genus *Australopithecus* means …

A Australian man.
B southern ape.
C ape that used tools.
D upright ape.

1.1.5 The allele for black fur (B) is dominant over the allele for brown fur (b). Which one of the following crosses will result in a ratio of 50% homozygous black to 50% heterozygous black?

A Bb X bb
B BB X bb
C BB X Bb
D Bb X Bb

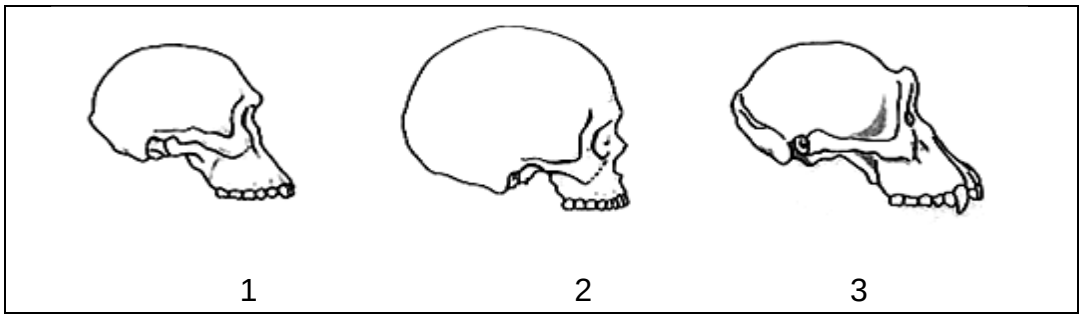
1.1.6 The difference between a nucleic acid and a nucleotide is that …

A nucleotides are building blocks of nucleic acids.
B nucleic acids are building blocks of nucleotides
C nucleic acids are in the nucleus and nucleotides are in the cytoplasm.
D nucleotides are larger than nucleic acids.

1.1.7 Meiosis is a process during which ...

A two daughter cells identical to the parent cell are formed.
B four daughter cells identical to the parent cell are formed.
C the diploid number of the chromosomes is reduced to the haploid number.
D the haploid number of the chromosomes is changed to the diploid number.

1.1.8 Study the diagrams of hominid skulls below.



The correct sequence of evolution, from oldest to youngest, of the Hominid species shown is

A 2, 3, 1
B 3, 1, 2
C 1, 3, 2
D 2, 1, 3

1.1.9 Which of the following are true of fossilisation?

i) Organisms tend to decay before becoming fossils
ii) Organisms were preserved as fossils
iii) Animals with hard parts are preserved more easily
iv) Geological processes may destroy fossils

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

1.1.10 Study the table below, showing various amino acids codded for by various mRNA codons.

mRNA codons	Corresponding amino acids
GCG	Alanine
AUG	Methionine
AUA	Isoleucine
AGG	Arginine

Which amino acid is coded by the DNA triplet of nitrogenous bases TAC?

A Alanine
B Arginine
C Isoleucine
D Methionine

(10x2) **(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 explanation that species experience long periods without physical change, followed by short periods of rapid physical change.

1.2.2 Similar structures on different organisms that suggest they have a common ancestor.

1.2.3 The distribution of species in different parts of the world.

1.2.4 Intermediate fossils showing features of both more primitive and more advanced organisms

1.2.5 The natural shape of a DNA molecule

1.2.6 A genetic cross in which the offspring express an intermediate phenotype of the two parents' characteristics

1.2.7 All the different alleles of genes in a particular population

1.2.8 A large opening in the skull through which the spinal cord passes

1.2.9 Type of variation where a range of different phenotypes for a particular characteristic is observed (9 x 1) **(9)**

1.3 Indicate whether each of the statement in COLUMN I applies to **A ONLY, B ONLY, BOTH A AND B** or **NONE** of the items in COLUMN II (1.3.1 to 1.3.4) in the ANSWER BOOK.

COLUMN I	COLUMN II
1.3.1 A visual representation of an organism's chromosomes	A: Karyotype B: Phenotype
1.3.2 Inheritance of the disorder linked to a sex chromosome	A: Sickle cell anaemia B: Colour blindness
1.3.3 Provides genetic evidence for the 'Out of Africa' hypothesis	A: Mitochondrial DNA B: DNA from X chromosomes
1.3.4 A nitrogenous base only found in DNA	A: Uracil B: Adenine
1.3.5 A genetic cross in which both alleles are equally expressed in the phenotype	A: Co-dominance B: Complete dominance

(5x2) **(10)**

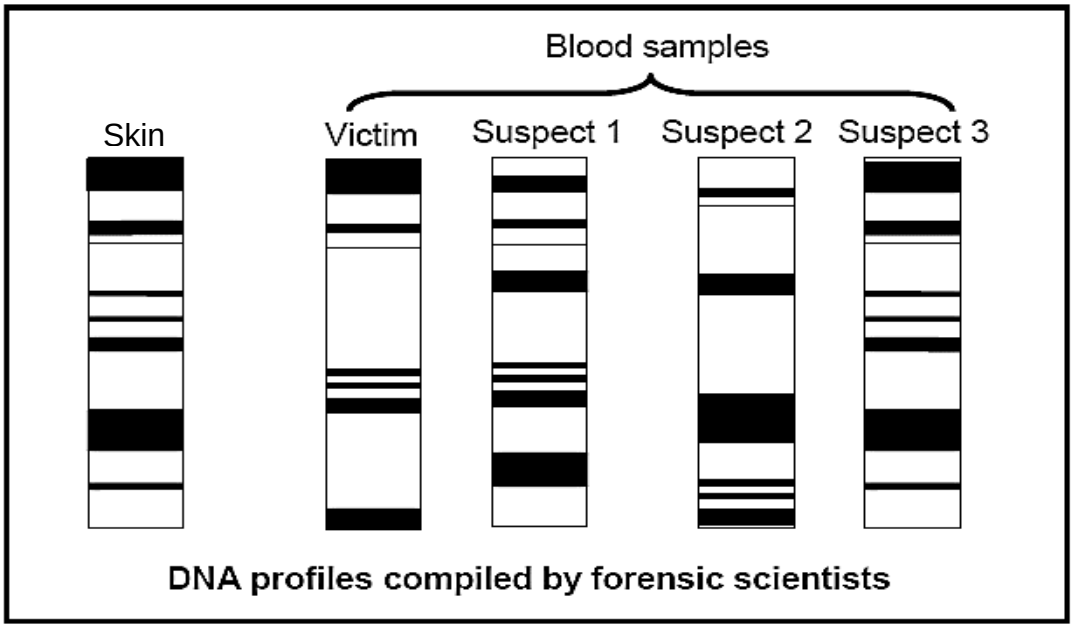
1.4 Read the following case study and use the forensic evidence to solve the crime.

Inspector Ndlovu and Sergeant van Wyk were investigating a murder case. The victim was a 34 year-old man. He had been stabbed and left to die. There was skin under his nails, which he could have got from the murderer during the fight.

Three possible suspects were arrested. All three of them were required to give a blood sample and a sample was also taken from the victim.

DNA profiles of the four samples were compared with the DNA profiles of the two samples taken from the crime scene. The diagram below shows the DNA genetic profile of :

- Blood sample of a murdered male victim
- Blood sample of three male suspects
- Skin found under the nails of the victim



DNA profiles compiled by forensic scientists

1.4.1 Which of the three suspects is most likely the murderer? (2)

1.4.2 Give a reason for your answer to QUESTION 1.4.1. (2)

1.4.3 Give TWO reasons why this evidence cannot be considered 100% VALID/ RELAIBLE in a court of law. (2)

1.4.4 Name THREE benefits of DNA profiling other than for solving crimes. (3)

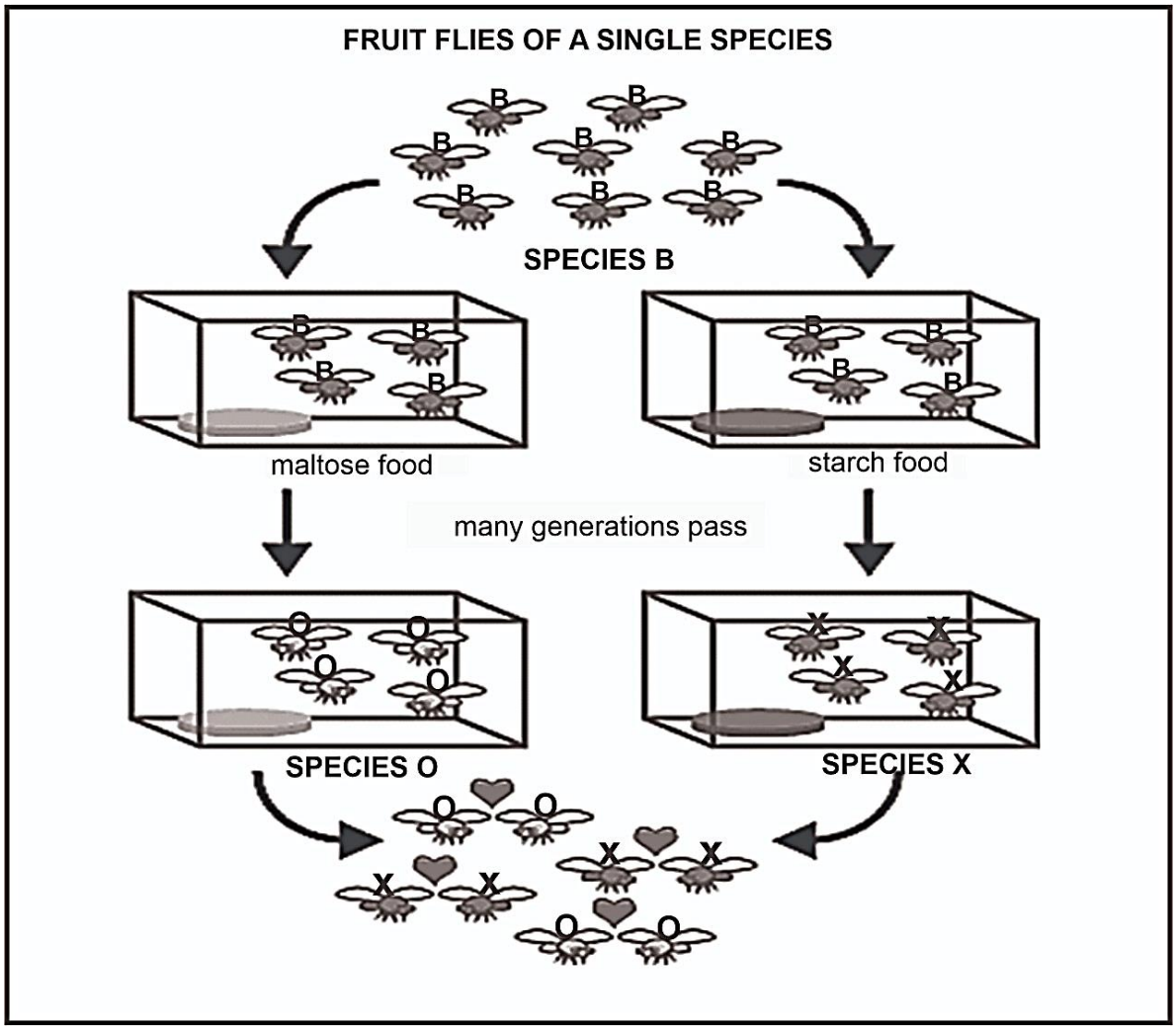
1.4.5 Define DNA profiling (2)

(11)

TOTAL SECTION A: 50

SECTION B
QUESTION 2

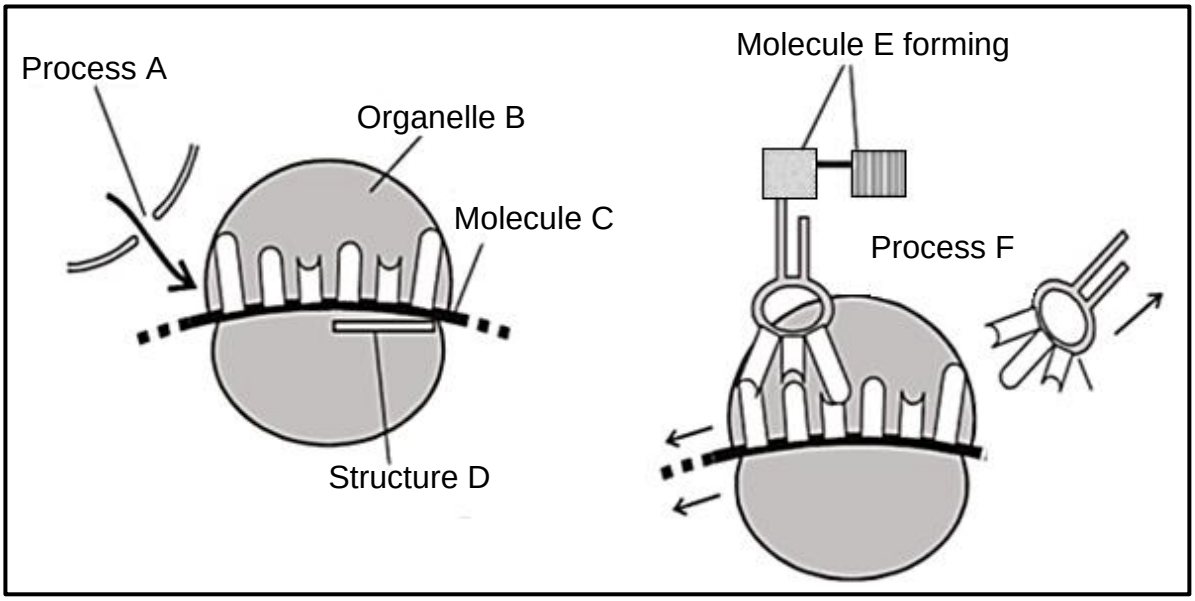
2.1 Study the diagram below that show an experiment conducted by Diane Dodd in the laboratory. She used fruit flies to demonstrate an evolutionary process that occurs when new species are formed.



2.1.1 Which evolutionary process is illustrated in the diagram above? (1)
2.1.2 Describe the process named in QUESTION 2.1.1 as it occurred in the laboratory shown above. (6)
2.1.3 Tabulate two differences between Lamarck `s theory and Darwin`s theory of natural selection. (5)

(12)

2.2 Study the diagrams below and answer the questions that follow



2.2.1 Identify **Process A** and **Organelle B** respectively. (2)

2.2.2 Name and describe the stage of protein synthesis that takes place during Process **F**. (5)

2.2.3 A mutation occurred on the mRNA codon, and it read CGG instead of GGG.

(a) What type of mutation has occurred? (1)

(b) Give TWO effects of such a mutation on formation of Molecule E (4)

(12)

2.3

In Croton plants, green leaves are dominant over variegated leaves (leaves with white and green spots).

A plant which is heterozygous for green leaves is crossed with one with variegated leaves.

Use the symbol **G** for green leaves and **g** for variegated leaves and answer the questions that follow.

2.3.1 Give the percentage of the F1 generation that will have variegated leaves. (2)

2.3.2 The plant with the green leaves is self-pollinated and 128 seedlings were obtained. Draw a genetic cross to indicate the genotypes of the F2 generation. (6)

2.3.3 According to the genetic cross in QUESTION 2.3.2, how many plants:

(a) have variegated leaves? (1)

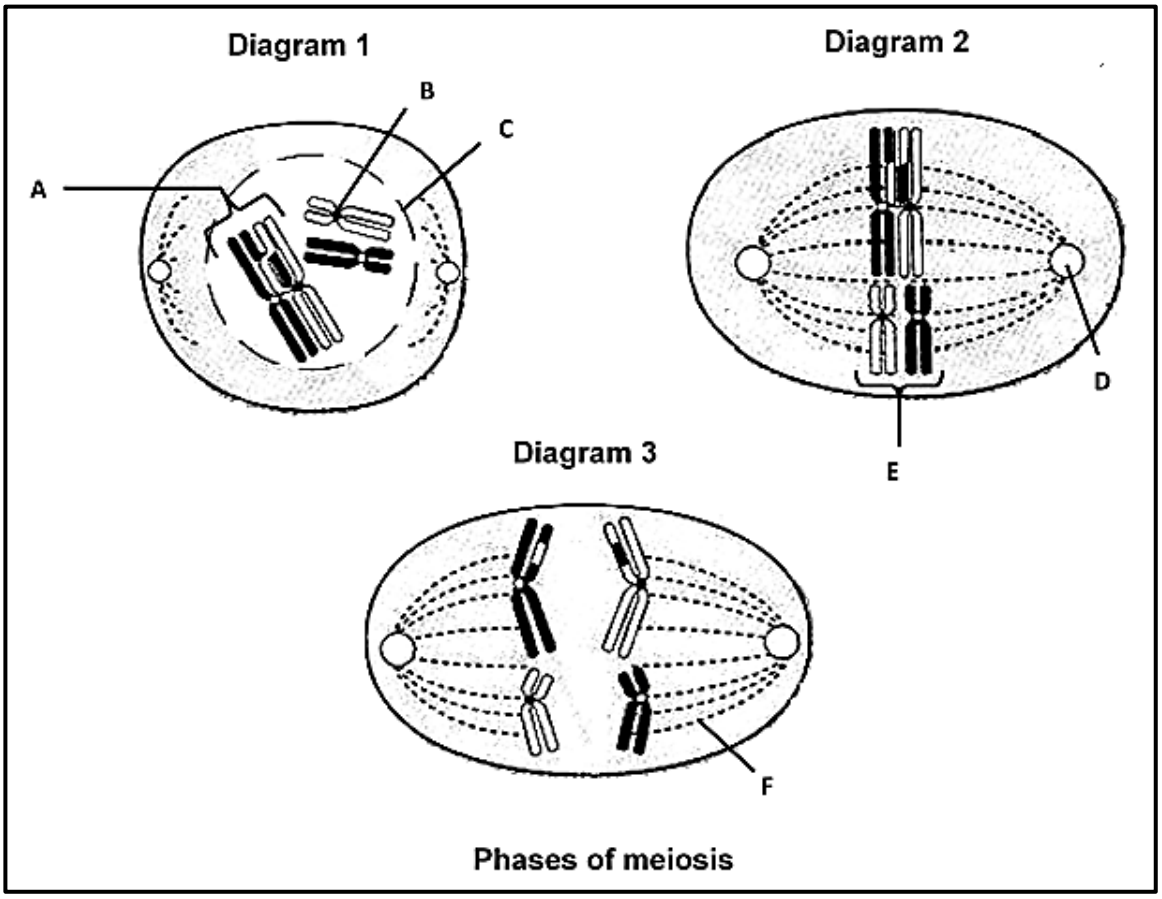
(b) are heterozygous for green leaves? (1)

(c) are homozygous dominant? (1)

2.3.4 State Mendel's Principle of Independent Assortment (2)

(13)

2.4 Study the diagrams below and answer the questions that follow.



2.4.1 Name the process taking place at A (1)

2.4.2 Identify structure D (1)

2.4.3 State ONE function of structure F (2)

2.4.4 State ONE visible reason in Diagram 2 which indicates that meiosis is taking place. (2)

2.4.5 Name ONE organ in the human female body where the process of meiosis will occur. (1)

2.4.6 Identify the phase in Diagram 3. (1)

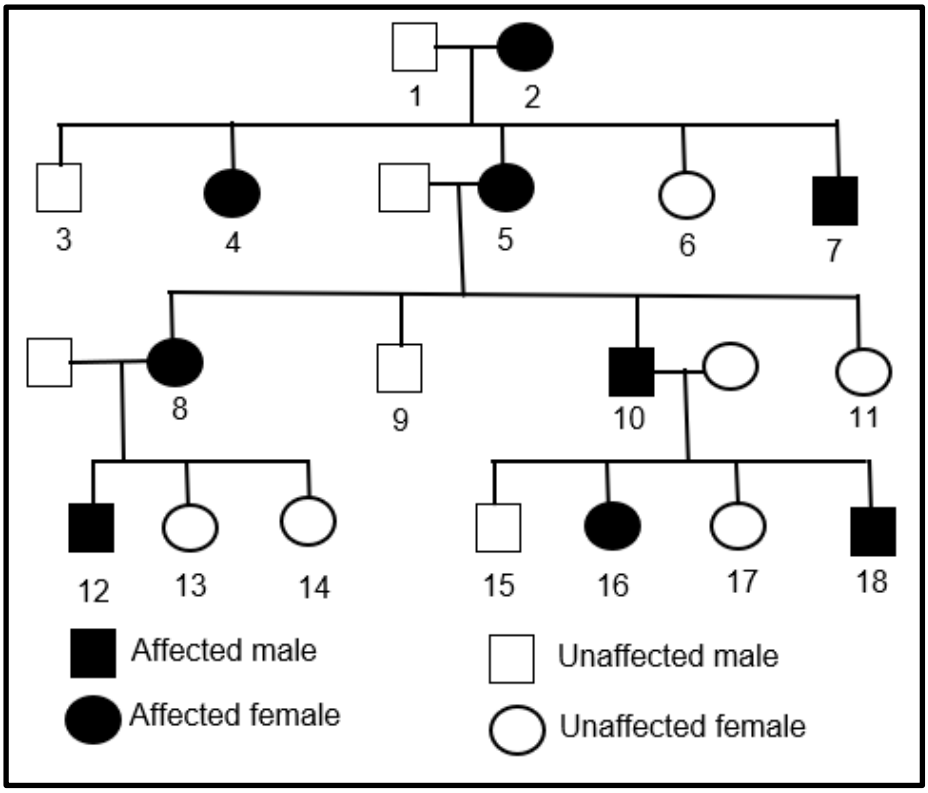
2.4.7 Describe how meiosis contributes to genetic variation in a species. (5)

(13)

TOTAL QUESTION 2: 50

QUESTION 3

3.1 Polydactyly (extra finger/toe) is a dominant trait in humans controlled by a single pair of alleles. The pedigree diagram below shows a family in which this trait has occurred. Answer the questions below, using **F** to represent the allele for polydactyly and **f** to represent the unaffected recessive allele.



3.1.1 How many of the male offspring in this pedigree diagram are polydactyl? (1)

3.1.2 Is this condition sex-linked? Use the information provided to justify your answer. (3)

3.1.3 Give the genotypes of individuals:
(a) 2
(b) 10 (2)

3.1.4 Give the phenotypes of individuals:
(a) 14
(b) 18 (2)

3.1.5 How many generations are indicated in the pedigree diagram above? (1)

3.1.6 Can any of the affected offspring in this pedigree diagram be homozygous for polydactyly? Explain your answer. (2)

(11)

3.2 A learner wanted to investigate the relationship between the number of babies born with Down Syndrome and the age of their mothers. He obtained information by visiting the local hospitals.
Study the table below which shows the results he obtained and answer the questions that follow.

Age of mother giving birth	**Number of babies born with Down's syndrome per 100 births**
21 - 25	3
26 - 30	5
31 - 35	11
36 - 40	25
41 - 45	50

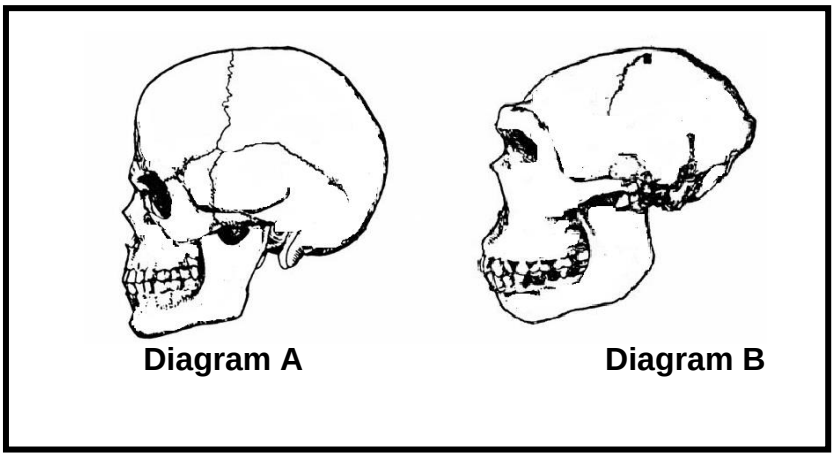
3.2.1 Use the results above to draw a histogram. (6)

3.2.2 From the results obtained in this survey, what conclusion can be drawn? (2)

3.2.3 From your understanding of Meiosis, explain how this condition of Down syndrome happens, and the specific name given to the location at which it occurs. (4)

3.2.4 If you were a genetic counsellor, what advice would you give to a woman over the age of 40 who desires to have a biological child? (3)
(15)

3.3 Diagrams A and B below illustrate the skulls of *Homo erectus* and *Homo sapiens.* Study them and answer the questions that follow. Diagrams are drawn to scale.



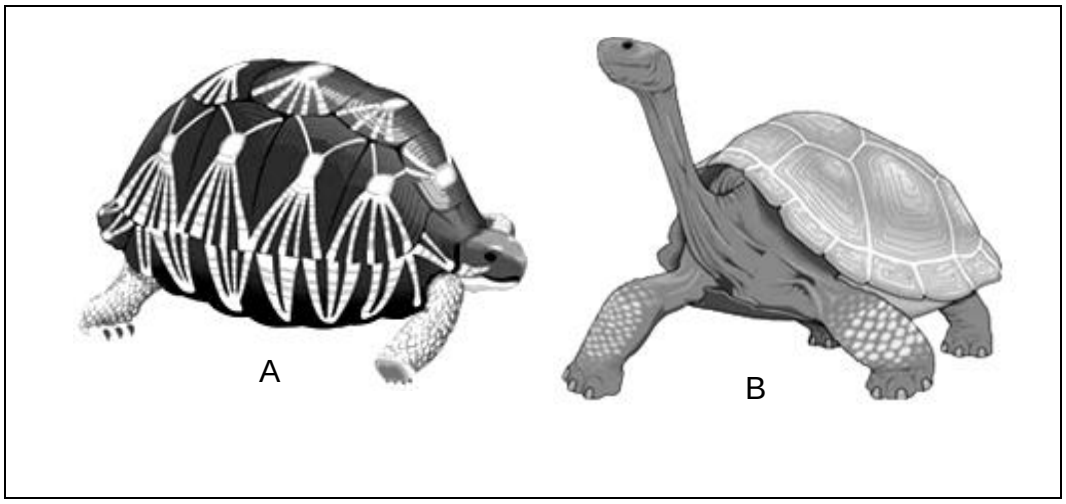
3.3.1 Which diagram (A or B) represents Homo sapiens? (1)

3.3.2 Tabulate THREE visible differences between diagrams A and B (7)

3.3.3 Describe the significance of Homo erectus to the "out of Africa" hypothesis. (2)

3.3.4 Give the names of TWO hominin genera that were ONLY found in Africa. (2)
(12)

3.4 During his journey in the South Pacific Darwin discovered that there were different species of tortoises on each of the two different islands in the Galapagos. One had a domed shell and short neck and the other one had a longer neck. The two islands had different vegetation. One of the islands (Island X) was rather dry. It had no grass, but rather short tree like cactus plants. On the other island (Island Y), there were no cactus plants, but it had a good supply of water and grass grew across the island



3.4.1 Which tortoise (A or B) would have been found on island X?
Give a reason for your answer based on the text and diagrams. (3)

3.4.2 Darwin suggested that these two species on the different islands might have evolved from a common ancestor from the mainland.
Explain how this could have occurred. (9)
(12)

TOTAL QUESTION 3: 50

TOTAL SECTION B: 100

GRAND TOTAL:150