



**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:

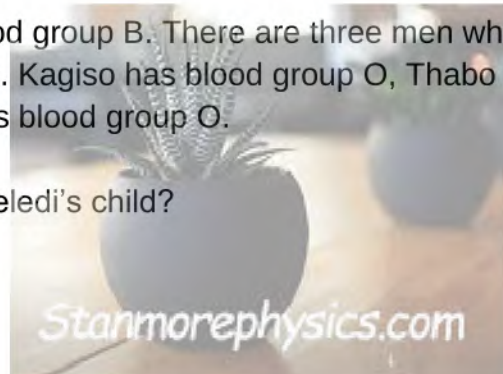
- 1 Taung child
- 2 Little foot
- 3 Karabo
- 4 Mrs Ples

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



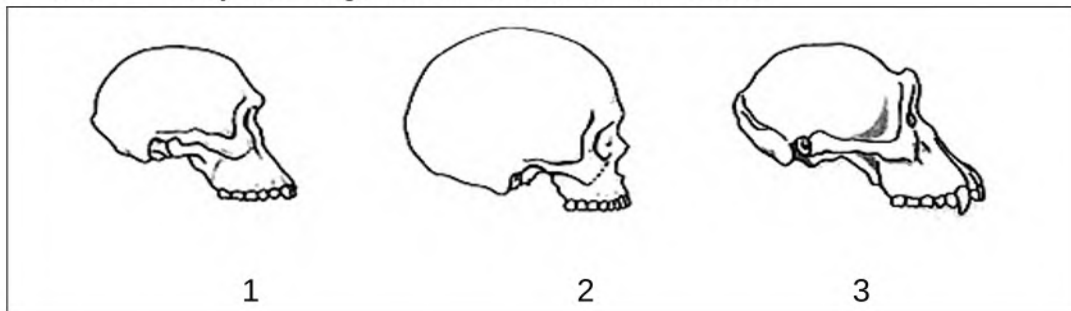
1.1.3 According to Charles Darwin's theory, natural selection states that.....

- 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 coded 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)

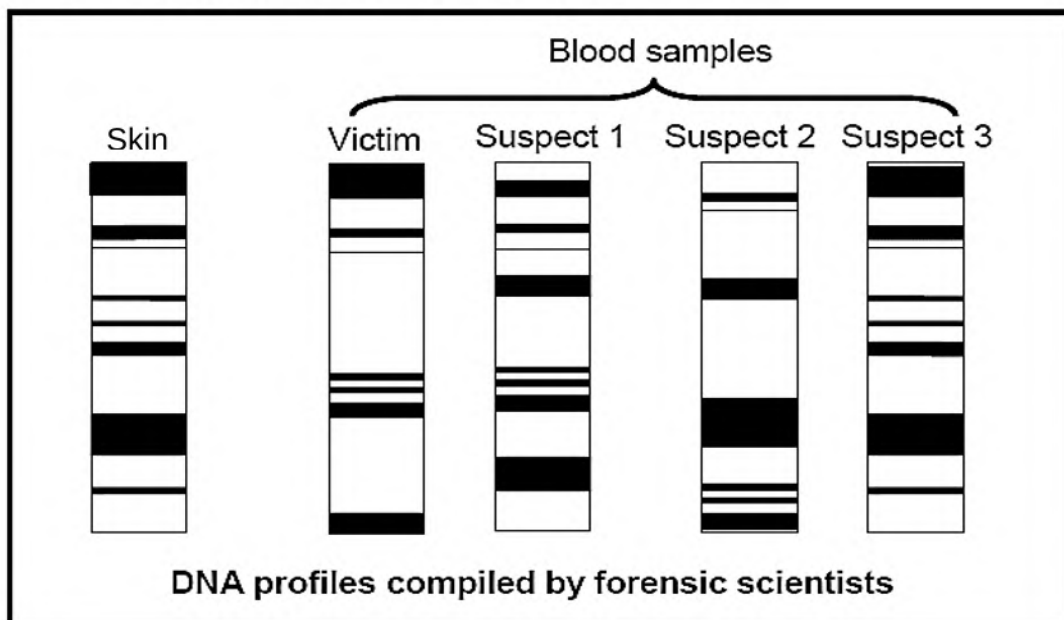
- 1.2 Give the correct **biological term** for each of the following descriptions. Write only the term next to the question numbers (1.2.1 to 1.2.8) in the ANSWER BOOK.
- 1.2.1 The explanation that species experience long periods without physical change, followed by short periods of rapid physical change.
- 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



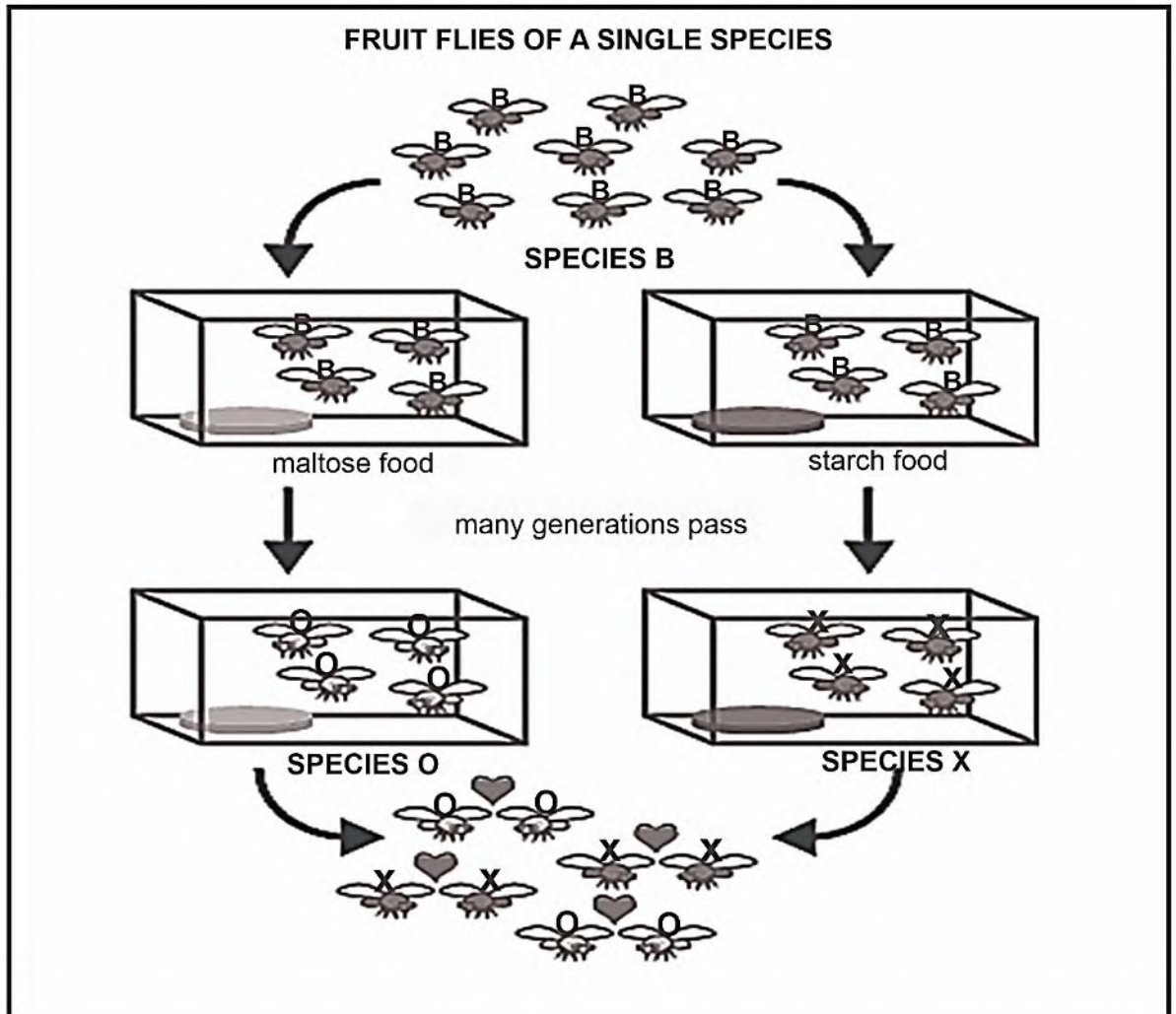
- 1.4.1 Which of the three suspects is most likely the murderer? (2)
- 1.4.2 Give a reason for your answer to QUESTION 1.4.1. (2)
- 1.4.3 Give TWO reasons why this evidence cannot be considered 100% VALID/ RELIABLE in a court of law. (2)
- 1.4.4 Name THREE benefits of DNA profiling other than for solving 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.



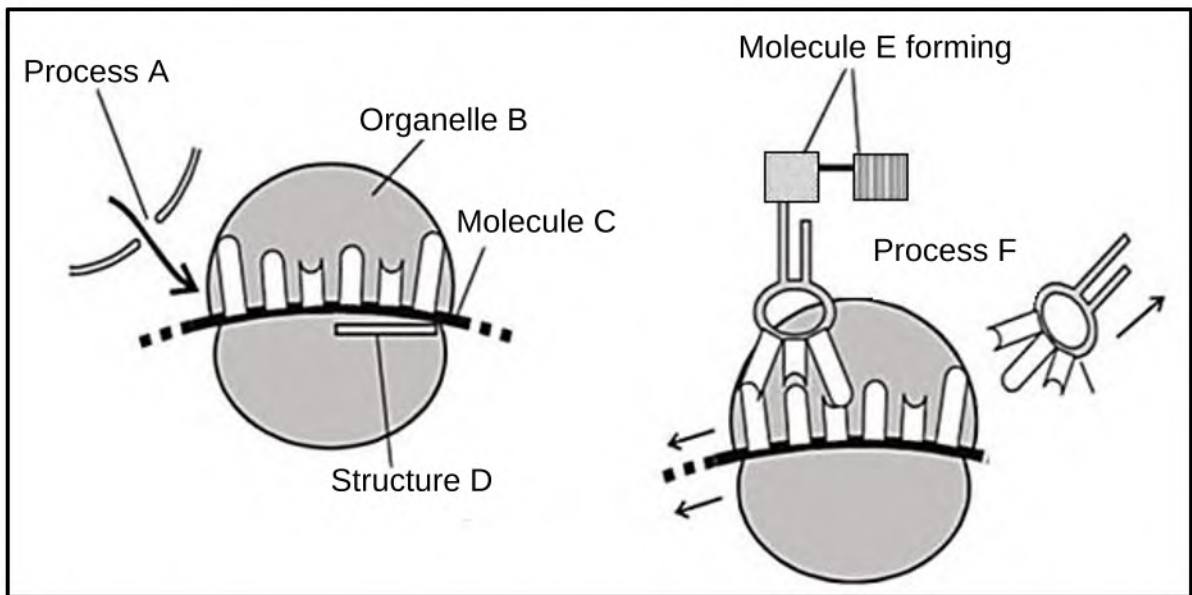
- 2.1.1 Which evolutionary process is illustrated in the diagram above? (1)
- 2.1.2 Describe the process named in QUESTION 2.1.1 as it occurred in the laboratory shown above. (6)
- 2.1.3 Tabulate two differences between Lamarck`s theory and Darwin`s theory of natural selection. (5)

**(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.

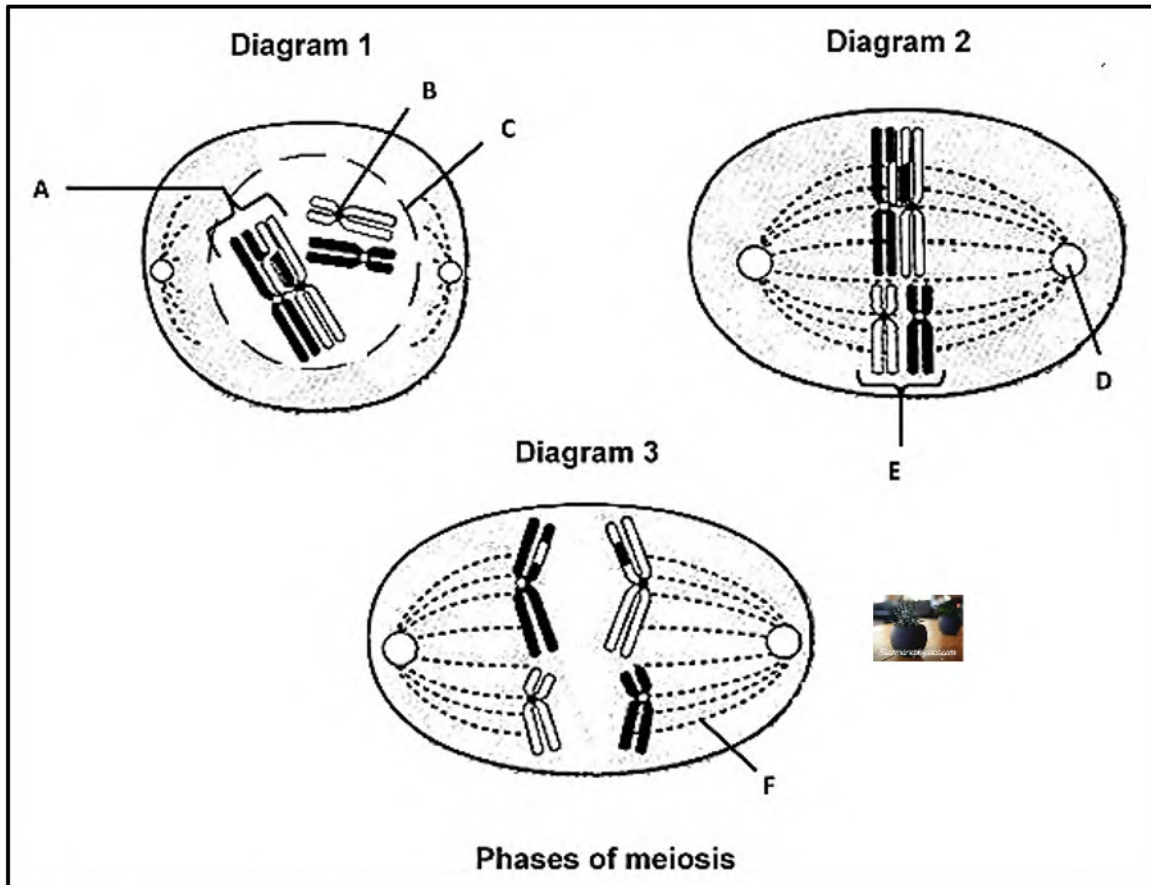
Use the symbol **G** for green leaves and **g** for variegated leaves and answer the questions that follow.

- 2.3.1 Give the percentage of the F<sub>1</sub> 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 F<sub>2</sub> 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.



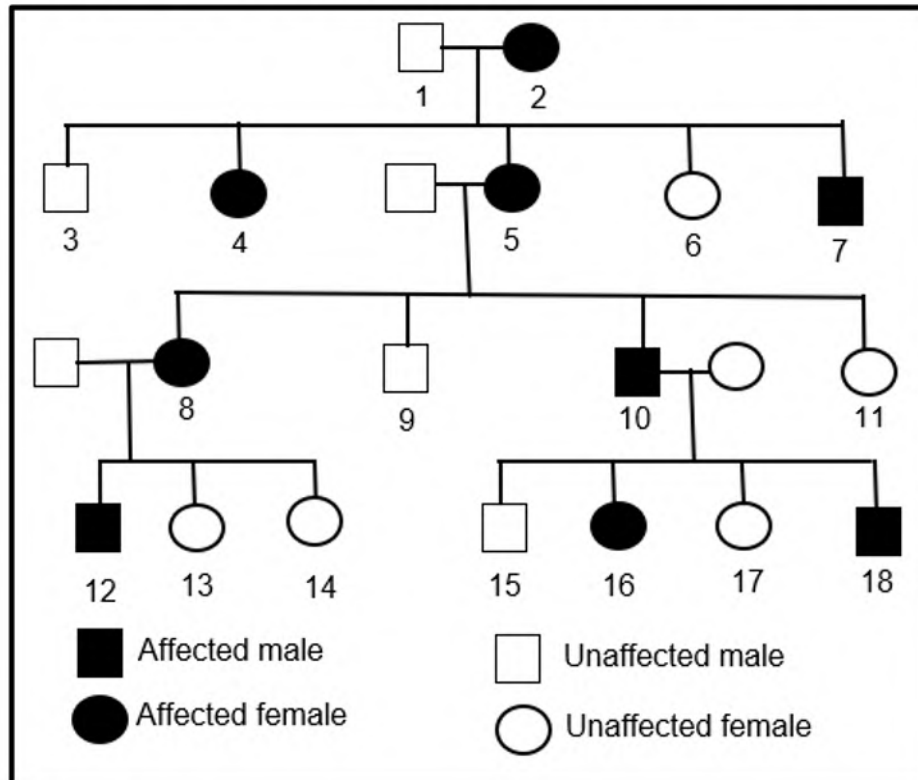
- 2.4.1 Name the process taking place at A (1)
- 2.4.2 Identify structure D (1)
- 2.4.3 State ONE function of structure F (2)
- 2.4.4 State ONE visible reason in Diagram 2 which indicates that meiosis is taking place. (2)
- 2.4.5 Name ONE organ in the human female body where the process of meiosis will 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

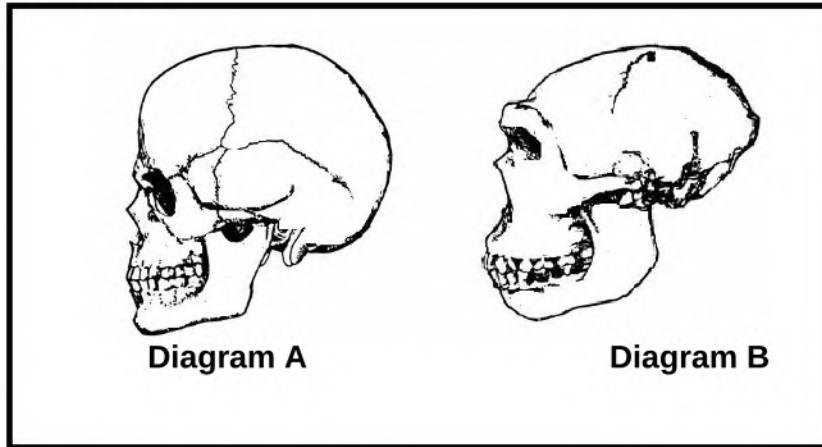
3.2.1 Use the results above to draw a histogram. (6)

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)

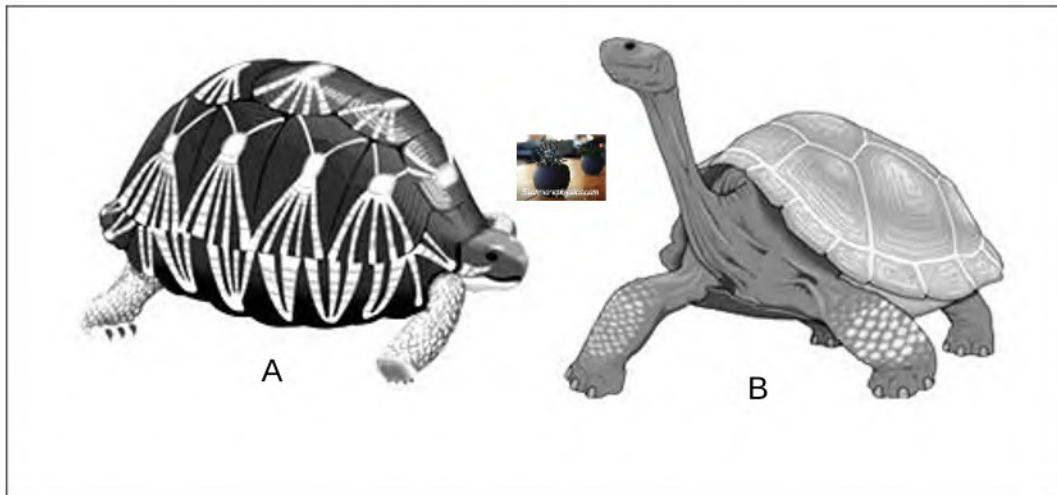
3.2.4 If you were a genetic counsellor, what advice would you give to a woman over the age of 40 who desires to have a biological child? (3)  
**(15)**

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**





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**GRADE 12**

**LIFE SCIENCES P2  
SEPTEMBER 2021  
REVISED MARKING GUIDELINES  
09 SEPTEMBER 2021**

**MARKS: 150**

**This Marking Guideline consists of 12 pages**

## PRINCIPLES RELATED TO MARKING LIFE SCIENCES 2021

1. **If more information than marks allocated is given**  
Stop marking when the maximum mark is 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 the whole process is given when only part of it is required**  
Read all and credit the relevant part.
4. **If comparisons are asked for and descriptions are given**  
Accept if 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 becomes correct again, resume credit.
9. **Non-recognisable 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, 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 Provincial memo discussion meeting.
14. **If only letter is asked for and only name is given (and vice versa)**  
No credit.
15. **If units are not given in measurements**  
Memorandum will allocated marks for units separately, except where it is already given in the question.
16. **Be sensitive to the sense of an answer, which may be stated in a different way.**





**Adjusted marks indicated in YELLOW for Schools that were not able to present Human Evolution to their learners due to COVID disruptions**

**SECTION A**

**QUESTION 1**

1.1

1.1.1	B	✓✓		
1.1.2	B	✓✓		
1.1.3	C	✓✓		
1.1.4	B	✓✓		
1.1.5	C	✓✓		
1.1.6	A	✓✓		
1.1.7	C	✓✓		
1.1.8	B	✓✓		
1.1.9	C	✓✓		
1.1.10	D	✓✓	(10x2)	(20)
			(7x2)	<b>(14)</b>

1.2

1.2.1	Punctuate equilibrium	✓		
1.2.2	Homologous	✓		
1.2.3	Biogeography	✓		
1.2.4	Transitional	✓		
1.2.5	Double helix	✓		
1.2.6	Incomplete dominance	✓		
1.2.7	Gene pool	✓		
1.2.8	Foramen magnum	✓		
1.2.9	Continuous variation		(9x1)	(9)
			(7x1)	<b>(7)</b>

1.3

1.3.1	A only	✓✓		
1.3.2	B only	✓✓		
1.3.3	A only	✓✓		
1.3.4	None	✓✓		
1.3.5	A only	✓✓	(5x2)	(10)
			(4x2)	<b>(8)</b>

1.4

1.4.1 Suspect 3 ✓✓ (2)

1.4.2 The bands of the DNA profile of the skin ✓ found under the nails of the victim matches the bands of the DNA profile of the blood of suspect 3 ✓ (2)

1.4.3 Human error could have occurred in the laboratory ✓  
Specimens could have been deliberately swapped in the laboratory ✓  
Sample of a DNA taken from the victim could not give accurate profile/  
large length of DNA is required to get accurate profile ✓  
(Any 2) (2)

1.4.4

- Paternity tests ✓
  - Determining identity of dead persons ✓
  - Determining genetic disorders ✓
  - Tracking individuals in population ✓
- (Mark first THREE only)** (3)

1.4.5 The process by which the DNA of a person/ organism is analysed ✓  
to obtain a barcode pattern ✓ (2)  
**(11)**

**TOTAL SECTION A: 50**

**TOTAL SECTION A: 40**

**SECTION B**

**QUESTION 2**

2.1

2.1.1 Speciation ✓ (1)

2.1.2

- The fruit flies were separated into two groups ✓ (populations) of the same species ✓
- There is now no gene flow between the two populations ✓
- The fruit flies had different sources of food ✓ / lived under different environmental conditions
- The fruit flies underwent natural selection independently ✓ in each trough.
- Natural selection continued in each trough over many generations, ✓ resulting in each trough having a species that was quite different ✓ genotypically ✓ and phenotypically ✓ from species of the other trough.
- These differences prevented them from interbreeding ✓ and this led to the formation of two new species. ✓

(Any 6) (6)

2.1.3

Lamarck	Darwin
1. Law of use and disuse ✓	1. Natural selection ✓
2. Acquired characteristics are passed on to the next generation ✓	2. Genetic characteristics can be inherited by offspring from parents ✓
3. Organisms have an internal drive to change ✓ / deterministic	3. Organisms do not have an internal drive to change ✓ / nature selects
4. Individuals change ✓	4. Populations change ✓
5. Infers that there is no extinction because organisms adapt and survive ✓	5. Extinction occurs since organisms may have features that do not favour survival ✓

Rubric to assess the Table

Criterion	Mark
A comparison table is drawn with clear headings for each column	1
Any 2 corresponding differences	2 + 2
	<b>(5)</b>

**(12)**



2.2

2.2.1 Process A-Translocation✓/ transcription  
 Organelle B-Ribosome✓ (2)

2.2.2 Translation✓\*

- The mRNA strand from the nucleus becomes attached to the ribosome✓ with its codons exposed.
  - Each tRNA molecule carries a specific amino acid✓ according to its anti-codon✓
  - The anti-codon matches up with/is complementary to the codon of the mRNA✓
  - So that the amino acids are placed in the correct sequence✓
  - Adjacent amino acids are linked to form a protein. ✓
- (1x compulsory mark ✓\* + any 4 correct points) (5)



2.2.3 (a) Gene mutation ✓ (1)

(b) The amino acid coded for by the changed codon may be:

- different to the original amino acid ✓
- Thus causing a different protein to be produced ✓

**OR**

- The same as the original amino acid ✓
- Thus there will be no change to the protein produced ✓ (4)

**(12)**

2.3

2.3.1 50% ✓✓ (2)

2.3.2 **P2** Phenotype Green leaves x Green leaves✓  
 Genotype Gg x Gg✓  
**Meiosis**  
 G/Gametes G g x G g ✓  
**Fertilization**  
**F2** Genotype GG Gg Gg gg ✓  
 Phenotype 3 green leaves and 1 variegated leaves✓

**OR**

<b>Gametes</b>	<b>G</b>	<b>g</b>
<b>G</b>	GG	Gg
<b>g</b>	Gg	gg
Correct gametes ✓ Correct offspring genotypes✓		

Phenotype 3 green leaves and 1 variegated leaves✓

P2 and F2 ✓

Meiosis and fertilization ✓

Any 6 (6)

- 2.3.3 (a) One ✓/1 (1)  
(b) Two ✓/2 (1)  
(c) One ✓/1 (1)
- 2.3.4 Mendel's Principle of Independent Assortment:
- The various 'factors'/ alleles controlling the different characteristics/ genes are separate entities, ✓ not influencing each other in any way, and sort themselves out independently during gamete formation. ✓
- OR**
- The alleles of two (or more) different genes ✓ get sorted into gametes independently of one another. ✓
- OR**
- The allele that a gamete receives for one gene ✓ does not influence the allele received for another gene ✓
- (2)  
**(13)**
- 2.4
- 2.4.1 Crossing over ✓ (1)
- 2.4.2 D – Centriole ✓ (1)
- 2.4.3 Part F / Spindle threads:
- Allows for the attachment ✓ of chromosomes. ✓
  - Contracts ✓ to move chromosomes towards opposite poles ✓  
(any 1 x 2) (2)
- 2.4.4 The chromosomes are arranged in homologous pairs ✓ at the equator. ✓ (2)
- 2.4.5 Ovary ✓ (1)
- 2.4.6 Anaphase I ✓ (1)
- 2.4.7
- Crossing over takes place ✓
  - between homologous chromosomes ✓
  - leading to genetic material exchange ✓
  - There is also random arrangement ✓ of chromosomes along the equator. ✓
  - Different combinations of chromosomes move into each daughter cell ✓
  - thus leading to variation in gametes ✓ produced.
- (5)  
**(13)**

**TOTAL QUESTION 2: 50**

**QUESTION 3**

3.1

3.1.1 4✓ (1)

3.1.2 Not sex-linked ✓/ No (1)  
This disorder occurs equally frequently in males and females ✓  
The alleles do not occur on the X-chromosome ✓  
This is a dominant allele and the phenotype of polydactyly will be present even in the heterozygous genotype ✓ (Any 2) (2)

3.1.3 (a) 2: Ff ✓  
(b) 10: Ff ✓ (2)

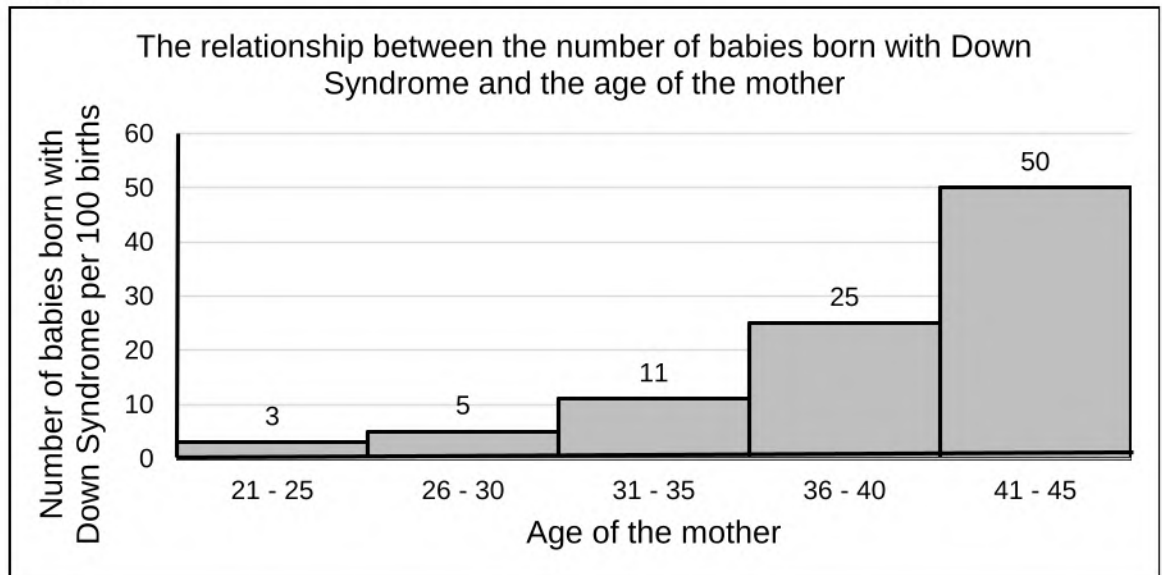
3.1.4 (a) 14: unaffected female ✓  
(b) 18: affected male ✓ (2)

3.1.5 4✓ generations (1)  
(Omitted from original Memo)

3.1.6 No. ✓  
Homozygous condition in the offspring is only possible if both parents have the affected allele ✓. (2)  
**(11)**

3.2

3.2.1





**Guideline for assessing the graph**

CRITERION	ELABORATION	MARK
Correct type of graph	Histogram: No spaces between the bars	1
Caption for the graph	Both variables included	1
Correct label for X and Y - axes	X-axis: Age of mother Y-axis: Number of babies born with Down syndrome	1
Correct scale for X and Y - axes	X-axis: Bars must be the same width Y-axis: Suitable scale for the values	1
Plotting of points	3 to 5 bars plotted and drawn correctly	2
	Only 1 to 2 bars plotted and drawn correctly	1

(6)

- 3.2.2 The chances of having a child with Down syndrome significantly increases with the increased age of the biological mother ✓✓

**OR**

The chances of having a child with Down syndrome is significantly lower, the younger the biological age of the mother ✓✓

(2)

- 3.2.3 This condition occurs during meiosis in the production of egg cells/ ova/ oogenesis ✓

When chromosome pairs do not separate in Anaphase in the first meiotic division ✓

Resulting in a gamete with two copies of chromosome 21 instead of one ✓

This is called non-disjunction ✓\*

The chromosomal abnormality is called Trisomy 21 ✓\*

(2 x **compulsory mark** ✓\* + any 2) (4)

- 3.2.4 She needs to be made aware that she has a high risk of having a baby with Down syndrome. ✓

Recommend that if she decides to go ahead with the pregnancy, she should have:

- an ultrasound of the foetus ✓
- a blood test to determine any abnormalities ✓
- an amniocentesis to check the chromosome composition/karyotype of the foetus ✓ (Any one)

Present an alternative option of adoption of a healthy child ✓ and not run the risk of having a child with Down syndrome. (Any 3) (3)

**(15)**

3.3

3.3.1 (a) A✓ (1)

3.3.2

Diagram A	Diagram B
1. Brow ridges less pronounced✓	1. Brow ridges more pronounced✓
2. Larger cranium/brain✓	2. Smaller cranium/brain✓
3. Jaws not prognathous✓	3. Jaw protrudes✓ (prognathous)
4. Developed chin✓	4. Chin not developed✓
5. Rounder cranium✓	5. Elongated cranium✓
6. Zygomatic arch less developed✓	6. Zygomatic arch more developed✓
7. Smaller lower jaw	7. Larger lower jaw

Rubric to assess the Table

Criterion	Mark
A comparison table is drawn with clear headings for each column	1
Any 3 corresponding differences	3 x 2
	<b>(7)</b>

3.3.3 *H. erectus* was the first *Homo* species✓\* to move out of Africa. Their large bodies✓ and well adapted pelvic girdles✓ made them better bipedal runners and walkers✓ over long distances than *H. sapiens* (1 x **compulsory** ✓\* + any 1 other) (2)

3.3.4 *Ardipithecus* ✓  
*Australopithecus* ✓ (2)  
**(12)**

**3.3. For schools that did not present Human Evolution: disregard Q 3.3 (0)**

3.4

3.4.1 Tortoise B ✓  
Island X is dry and has shrub-height Cactus plants ✓  
Tortoise B has a long neck ✓  
which can be used to reach the cactus fruit ✓ on which it feeds  
(3)

3.4.2

- The common ancestral species originated from the South American mainland ✓
- The Galapagos islands formed through volcanic activity ✓
- Some of the tortoises may have been swept out to sea during a storm ✓ / flood
- And washed ashore on 2 different islands in the Galapagos ✓
- The original population was therefore separated by the Pacific Ocean and the islands that they inhabited ✓\*
- Each island has different environmental conditions ✓ / causing changes in vegetation
- Each group of tortoises underwent natural selection independently ✓
- Some tortoises that had longer necks (Group B) survived better on island X ✓ than on island Y, because they could feed on the cactus plants ✓
- While tortoises with shorter necks (Group A) survived better on island Y ✓ than island X, because they could feed on low growing grass ✓
- Each group became genotypically and phenotypically ✓ different ✓
- which might have prevented them from interbreeding ✓
- They become reproductively isolated ✓
- leading to the formation of new species ✓

(1 x **compulsory** ✓\* + any 8 others) (9)  
(12)

**TOTAL QUESTION 3: [50]**  
**TOTAL SECTION B: 100**  
**GRAND TOTAL : 150**

#### **RECOMMENDATION**

**Adjusted marks indicated in YELLOW for Schools that were not able to present Human Evolution to their learners due to COVID disruptions**

**ADJUSTED MARKS**  
**TOTAL QUESTION 3: [38]**  
**TOTAL SECTION B: 88**  
**GRAND TOTAL : 128**

**Raw mark obtained** x 150 = **converted mark** out of 150  
**128**