



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**SENIOR CERTIFICATE/
NATIONAL SENIOR CERTIFICATE**

GRADE 12

LIFE SCIENCES P2

NOVEMBER 2020(2)

MARKS: 150

TIME: 2½ hours

This question paper consists of 17 pages.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

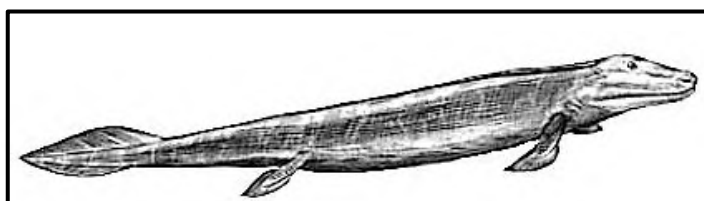
1. Answer ALL the questions.
2. Write ALL the answers in the ANSWER BOOK.
3. Start the answers to EACH question at the top of a NEW page.
4. Number the answers correctly according to the numbering system used in this question paper.
5. Present your answers according to the instructions of each question.
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 must use a non-programmable calculator, protractor and a 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 correct answer and write only the letter (A to D) next to the question number (1.1.1 to 1.1.10) in the ANSWER BOOK, e.g. 1.1.11 D.

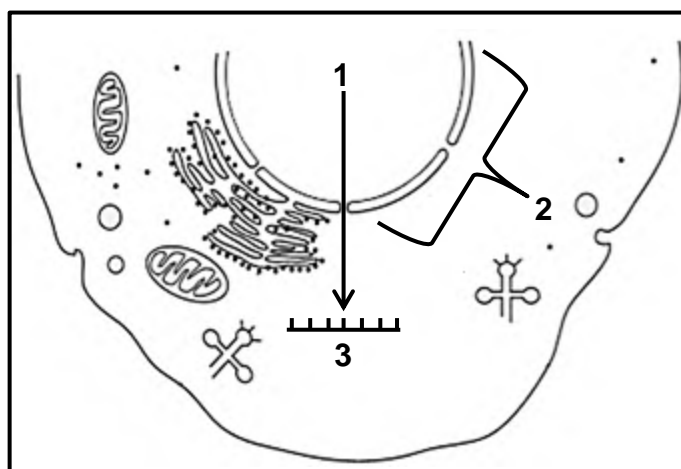
- 1.1.1 Which ONE of the following may result in Down syndrome in humans?
- A A gene mutation on chromosome 21
 - B Failure of chromosome pair 21 to separate during anaphase I
 - C Failure of the gonosomes to separate during meiosis II
 - D A gene mutation occurs on the X chromosome
- 1.1.2 Variation within a species is introduced through ...
- A random mating and asexual reproduction.
 - B mitosis and random fertilisation.
 - C random mating and random fertilisation.
 - D mitosis and meiosis.
- 1.1.3 African apes and humans are similar. Both have ...
- A small jaws and well-developed brow ridges.
 - B opposable thumbs and bare fingertips.
 - C gaps between their teeth and eyes in front.
 - D an upright posture and a cranial ridge.
- 1.1.4 The diagram below shows *Tiktaalik roseae*, a fish that may be the ancestor of the first organisms to live on land.



According to Lamarck, this species of fish may have evolved the ability to 'walk' on land by ...

- A undergoing natural genetic mutations which caused the fins to develop into legs.
- B the process of natural selection.
- C passing on the acquired characteristic of fins to their offspring.
- D stretching its fins and using them for 'walking'.

1.1.5 The diagram below shows some of the processes, molecules and structures that are involved in protein synthesis in a cell.



Which ONE of the following is the CORRECT labels for 1, 2 and 3 in the diagram?

	PROCESS 1	STRUCTURE 2	MOLECULE 3
A	transcription	ribosome	tRNA
B	translation	ribosome	mRNA
C	transcription	nucleus	mRNA
D	translation	nucleus	tRNA

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

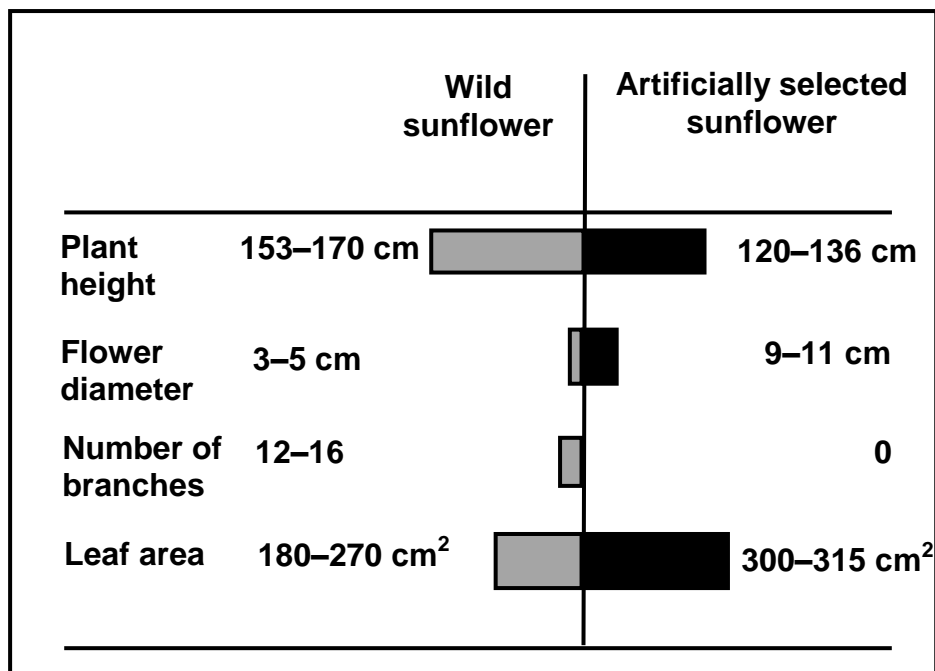
Which ONE of the following is the CORRECT phenotypic ratio of the F₂-generation?

- A 1 purple : 1 pink
- B 1 purple : 3 pink
- C 3 purple : 1 pink
- D 1 purple : 2 pink

1.1.7 Which ONE of the following scientists discovered fossils of *Homo sapiens* and *Ardipithecus sp*?

- A Raymond Dart
- B Lee Berger
- C Louis Leakey
- D Tim White

1.1.8 The diagram below compares characteristics of wild sunflowers with sunflowers that have been artificially selected.



Which ONE of the following characteristics was found undesirable by humans?

- A Number of branches and leaf area
- B Plant height and leaf area
- C Plant height and flower diameter
- D Plant height and number of branches

1.1.9 Punctuated equilibrium suggests the following:

- A Evolution is always a slow and gradual process.
- B Natural selection does not explain evolution.
- C New species can appear quickly, over a relatively short period of time.
- D Artificial selection is the only mechanism that causes evolution.

1.1.10 A group of students observed that the long-term use of antibiotics results in the decreased control of bacterial infections.

From this observation the students stated that:

Antibiotic resistance in bacteria is caused by the long-term use of antibiotics.

This statement is a/an ...

- A theory.
- B aim.
- C hypothesis.
- D conclusion.

(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 1.2.7) in the ANSWER BOOK.

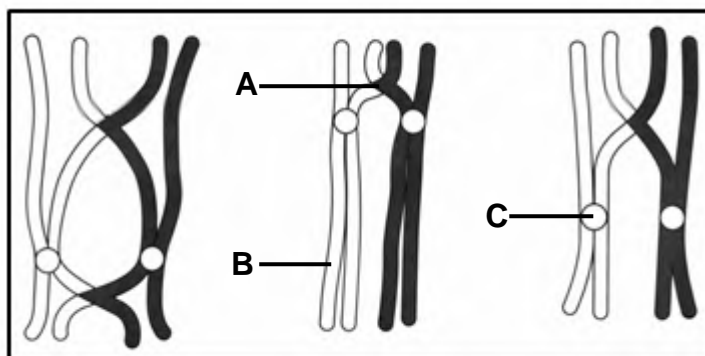
- 1.2.1 Similar structures in different organisms indicating descent with modification
- 1.2.2 Large, pointed teeth in African apes that are used for tearing food
- 1.2.3 The part of the skull that houses the brain
- 1.2.4 The non-sex chromosomes in humans
- 1.2.5 The network of genetic material found in the nucleus during interphase
- 1.2.6 The number, shape and arrangement of all the chromosomes in the nucleus of a somatic cell
- 1.2.7 Having a protruding jaw (7 x 1) **(7)**

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 Long and narrow pelvis	A: African apes B: Humans
1.3.2 The point of attachment of two overlapping chromatids	A: Locus B: Chiasma
1.3.3 Variation in human height	A: Continuous B: Discontinuous

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

1.4 The diagram below represents ALL the chromosomes in a cell that is undergoing normal cell division.



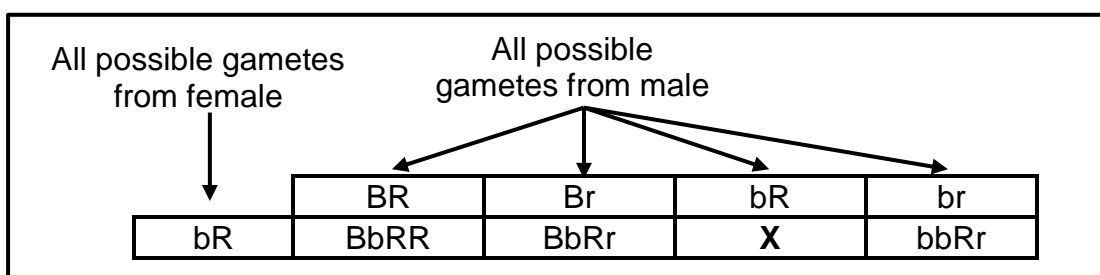
- 1.4.1 Name the:
- (a) Type of cell division that is occurring in the cell in the diagram (1)
 - (b) Phase of cell division during which the chromosomes behave as shown in the diagram (1)
- 1.4.2 Where in the human female body would the type of cell division named in QUESTION 1.4.1(a) take place? (1)
- 1.4.3 Give the LETTER and NAME of the structure that attaches to the spindle fibres. (2)
- 1.4.4 How many chromosomes will be found in each daughter cell at the end of this cell division? (1)
- (6)**

1.5 There is variation in the characteristics of fur colour and fur texture in cats.

The table below shows the alleles that control these two characteristics.

CHARACTERISTIC	ALLELE	PHENOTYPE
Fur colour	B	Black
	b	White
Fur texture	R	Rough
	r	Smooth

The Punnett square below shows the inheritance of these alleles in a genetic cross.



1.5.1 Name the:

- (a) Dominant phenotype for fur colour (1)
- (b) Recessive phenotype for fur texture (1)

1.5.2 Give the:

- (a) Genotype of offspring **X** (1)
- (b) Phenotype of the female parent (2)
- (c) Genotype of the male parent (1)



1.5.3 State the phenotype that ALL the offspring of this genetic cross have in common. (1)
(7)

1.6 Scientists compare the number of differences in the amino acid sequence to see how closely related species are. Fewer differences in the amino acid sequence mean the species are more closely related.

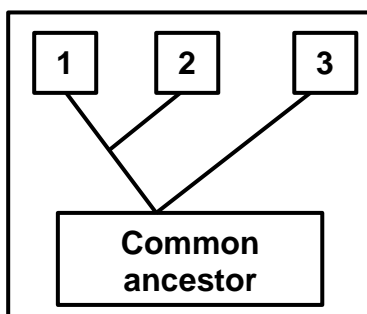
Cytochrome C is a protein that occurs in many species. The amino acid sequence of this protein differs between species.

The table below shows the number of differences in the amino acid sequences of three species, **A**, **B** and **C**.

	SPECIES B	SPECIES C
SPECIES A	11	3
SPECIES B		10

1.6.1 What type of evidence for evolution is being used in this table? (1)

1.6.2 Give the LETTER of the species, **A**, **B** and **C**, that should appear at positions **1**, **2** and **3** in the diagram below.



(3)
(4)

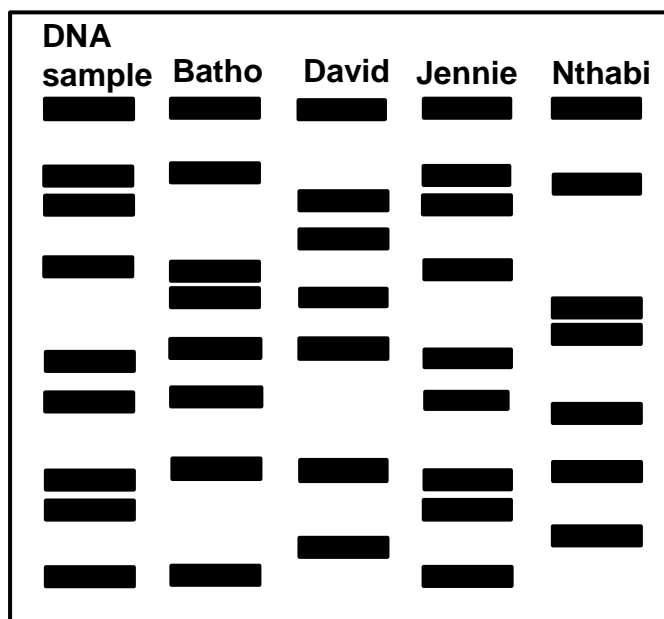
TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 Detectives were investigating a crime scene and found blood on a broken window. They suspected that the blood was that of the criminal. To identify the criminal, they analysed a DNA sample from the blood and compared it to that of four suspects.

The diagram below was produced:



- 2.1.1 Name the technique that was used to identify the criminal. (1)
 - 2.1.2 Who is the possible criminal? (1)
 - 2.1.3 Explain your answer to QUESTION 2.1.2. (2)
 - 2.1.4 State ONE other use of the technique identified in QUESTION 2.1.1. (1)
- (5)**

2.2 A farmer decided to have his best meat-producing bull cloned.

The following steps were used in the process:

- A muscle cell was taken from the bull and the nucleus was removed.
- An ovum was taken from a cow and the nucleus was removed and discarded.
- The nucleus from the muscle cell was placed in the empty ovum.
- The ovum was given an electric shock to stimulate normal cell division to produce an embryo.
- The embryo was placed in the uterus of a surrogate cow where it developed into the clone.

2.2.1 What is *cloning*? (1)

2.2.2 Explain why the nucleus of a muscle cell was used and not the nucleus of a sperm cell. (2)

2.2.3 Explain why the nucleus of the ovum was removed. (2)

2.2.4 State ONE benefit of cloning. (1)
(6)

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

2.3.1 How many alleles control the inheritance of blood groups? (1)

2.3.2 Describe the type of dominance that occurs in the inheritance of blood group **B** in the woman. (3)

2.3.3 Use a genetic cross to show all the possible genotypes and phenotypes of their children. (6)
(10)

2.4 Sickle cell disease is caused by a recessive allele and first appeared in humans as a result of a gene mutation.

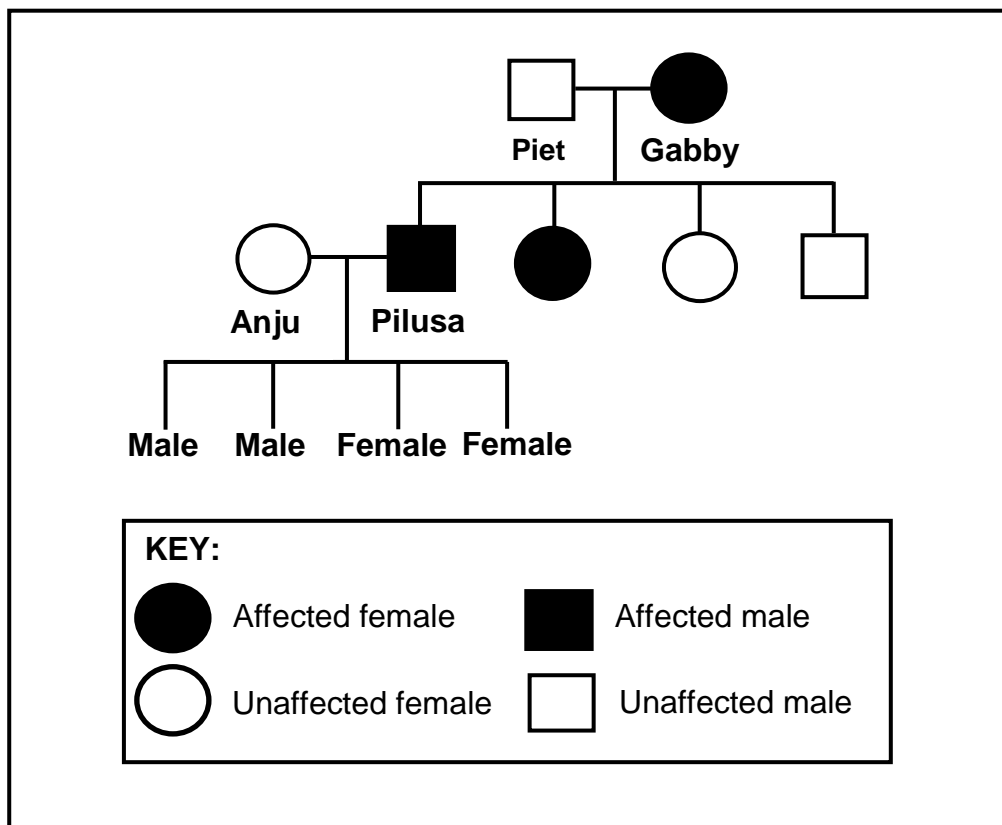
The table below shows the number of children born with sickle cell disease in some regions in a particular year.

REGION	NUMBER OF CHILDREN BORN WITH SICKLE CELL DISEASE
Democratic Republic of Congo	39 746
United States of America	90 128
Nigeria	91 011
United Kingdom	13 221
Tanzania	11 877
Other	59 750
Worldwide total	305 733

- 2.4.1 What is a *gene mutation*? (2)
- 2.4.2 Which region had the highest number of children born with sickle cell disease in that year? (1)
- 2.4.3 What percentage of the worldwide total of children born with sickle cell disease came from the Democratic Republic of Congo? Show ALL calculations. (3)
- 2.4.4 Use the letters **D** and **d** to give the genotype of a person who:
- (a) Suffers from sickle cell disease (1)
 - (b) Carries the allele but does not suffer from the disease (1)
- (8)**

2.5 Goltz syndrome is a sex-linked genetic disorder. It is caused by a dominant allele X^G .

The diagram below shows the inheritance of Goltz syndrome in a family.



2.5.1 Name the type of diagram shown. (1)

2.5.2 How many:

(a) Females are in this family (1)

(b) Males in the F_1 -generation have Goltz syndrome (1)

2.5.3 Give Gabby's genotype. (2)

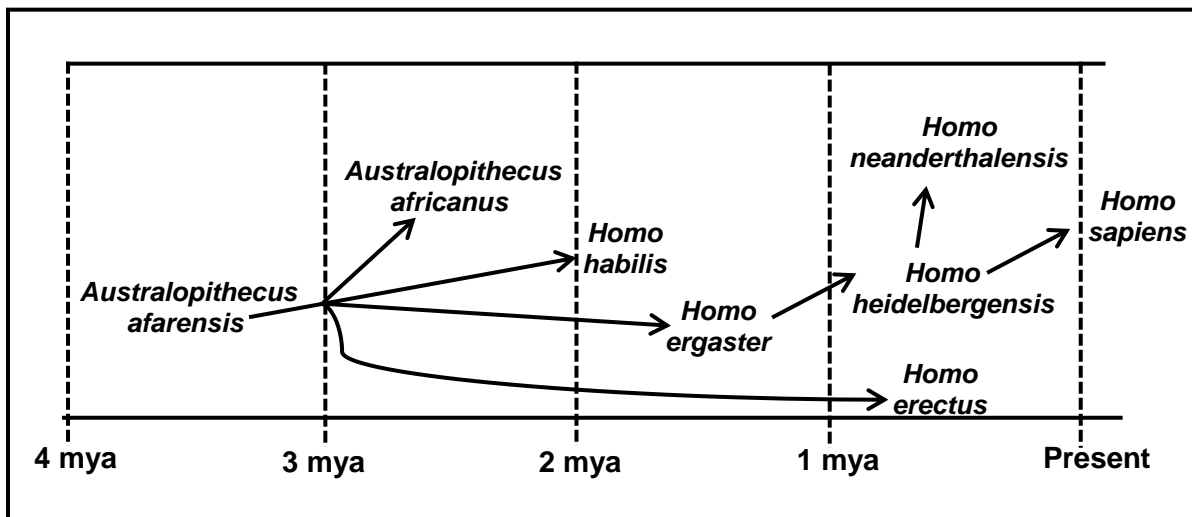
2.5.4 Anju and Pilusa have four children. Give the phenotype of their sons. (2)

2.5.5 Explain your answer to QUESTION 2.5.4. (4)

(11)
[40]

QUESTION 3

- 3.1 Describe the process of natural selection. (7)
- 3.2 Fossil evidence for humans may be interpreted in different ways. One possible model of human evolution is shown below.



- 3.2.1 Name the family to which all of the represented organisms belong. (1)
- 3.2.2 Describe how cultural evidence is used to support the theory of human evolution. (2)
- 3.2.3 How long ago did the most recent common ancestor of *H. erectus* and *H. heidelbergensis* exist on earth? (1)
- 3.2.4 Explain a possible reason why *H. ergaster* was placed between *A. afarensis* and *H. heidelbergensis* on the model. (2)
- 3.2.5 Explain how the fossils of organisms that existed from 4 mya to present time are used to support the 'Out of Africa' hypothesis. (3)
- (9)**

3.3 Male long-tailed widowbirds have extremely long tail feathers that they use in mating displays to attract females.

Scientists conducted an investigation to determine the relationship between the length of the male long-tailed widowbird's tail and its mating success.

The procedure was as follows:

- A total of 27 male long-tailed widowbirds was sampled and divided into 3 equal groups.
- The tail feathers of the birds in each group were treated in the following way:
 - Group 1 – Cut short
 - Group 2 – Made longer by adding artificial feathers
 - Group 3 – Left unchanged
- The 3 groups of male long-tailed widowbirds, along with female long-tailed widowbirds, were released into an environment suitable for mating.
- Each time a pair mated successfully they produced a nest and all the nests were counted.
- The average number of nests produced by each group was calculated and used as an indication of mating success.

The results are shown in the table below.

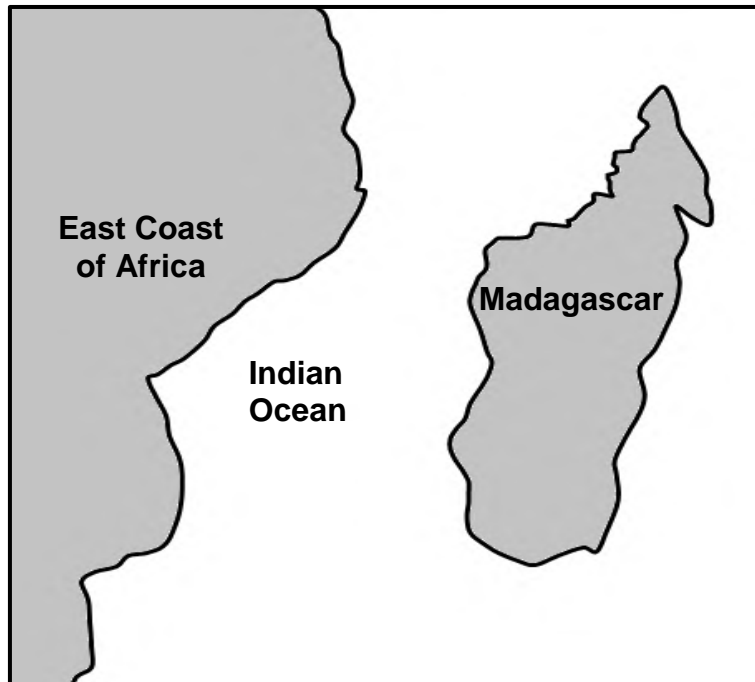
GROUP	AVERAGE NUMBER OF NESTS PRODUCED
1	0,5
2	2,5
3	1

- 3.3.1 Name the:
- (a) Reproductive isolating mechanism that occurs in long-tailed widowbirds (1)
 - (b) Independent variable in this investigation (1)
- 3.3.2 Explain why 27 long-tailed widowbirds were used in the investigation instead of only 3. (2)
- 3.3.3 Explain why Group 3 was included in the investigation. (2)
- 3.3.4 Draw a bar graph to represent the results of this investigation. (6)
- 3.3.5 State a conclusion for this investigation. (2)
- (14)**

3.4 Pottos and lemurs are small mammals.

Scientists believe that pottos and lemurs share a common ancestor that existed in Africa. Presently pottos only occur in Africa while lemurs are only found in Madagascar.

Madagascar is an island off the East coast of Africa as shown in the diagram below.



- 3.4.1 Explain how continental drift could have affected the distribution of the common ancestor. (4)
 - 3.4.2 Describe the speciation of the pottos and lemurs to become different species. (6)
- (10)**
[40]

TOTAL SECTION B: 80

SECTION C

QUESTION 4

Describe the location and structure of DNA, the process of DNA replication and the significance of this process for mitosis.

Content: (17)
Synthesis: (3)
(20)

c

NOTE: NO marks will be awarded for answers in the form of a table, flow charts or diagrams.

TOTAL SECTION C: 20
GRAND TOTAL: 150



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA



**SENIOR CERTIFICATE/
NATIONAL SENIOR CERTIFICATE**

GRADE 12

LIFE SCIENCES P2

NOVEMBER 2020(2)

MARKING GUIDELINES

MARKS: 150

These marking guidelines consist of 12 pages.

PRINCIPLES RELATED TO MARKING LIFE SCIENCES

- 1. If more information than marks allocated is given**
Stop marking when maximum marks 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 whole process is given when only a part of it is required**
Read all and credit the relevant part.
- 4. If comparisons are asked for, but descriptions are given**
Accept if the 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 become correct again, resume credit.
- 9. Non-recognised 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 the answer, 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 national memo discussion meeting.
- 14. If only the letter is asked for, but only the name is given (and vice versa)**
Do not credit.

15. **If units are not given in measurements**
Candidates will lose marks. Marking guidelines will allocate marks for units separately.
16. **Be sensitive to the sense of an answer, which may be stated in a different way.**
17. **Caption**
All illustrations (diagrams, graphs, tables, etc.) must have a caption.
18. **Code-switching of official languages (terms and concepts)**
A single word or two that appear(s) in any official language other than the learner's assessment language used to the greatest extent in his/her answers should be credited, if it is correct. A marker that is proficient in the relevant official language should be consulted. This is applicable to all official languages.
19. **Changes to the marking guidelines**
No changes must be made to the marking guidelines. The provincial internal moderator must be consulted, who in turn will consult with the national internal moderator (and the Umalusi moderators where necessary).
20. **Official marking guidelines**
Only marking guidelines bearing the signatures of the national internal moderator and the Umalusi moderators and distributed by the National Department of Basic Education via the provinces must be used.

SECTION A

QUESTION 1

1.1	1.1.1	B✓✓		
	1.1.2	C✓✓		
	1.1.3	B✓✓		
	1.1.4	D✓✓		
	1.1.5	C✓✓		
	1.1.6	A✓✓		
	1.1.7	D✓✓		
	1.1.8	D✓✓		
	1.1.9	C✓✓		
	1.1.10	C✓✓	(10 x 2)	(20)
1.2	1.2.1	Homologous✓ structures		
	1.2.2	Canines✓		
	1.2.3	Cranium✓		
	1.2.4	Autosomes✓		
	1.2.5	Chromatin✓		
	1.2.6	Karyotype✓		
	1.2.7	Prognathous✓	(7 x 1)	(7)
1.3	1.3.1	A only✓✓		
	1.3.2	B only✓✓		
	1.3.3	A only✓✓	(3 x 2)	(6)
1.4	1.4.1	(a) Meiosis✓/Meiosis I		(1)
		(b) Prophase I✓		(1)
	1.4.2	Ovary✓		(1)
	1.4.3	C✓ - centromere✓		(2)
	1.4.4	3✓/Three		(1)
				(6)
1.5	1.5.1	(a) Black✓fur		(1)
		(b) Smooth✓texture		(1)
	1.5.2	(a) bbRR✓		(1)
		(b) White (fur) with rough (texture)✓✓		(2)
		(c) BbRr✓		(1)
	1.5.3	Rough✓ texture		(1)
				(7)
1.6	1.6.1	Genetic✓ evidence		(1)
	1.6.2	1 - A✓ C		
		2 - C✓ OR A		
		3 - B✓ B		(3)
				(4)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

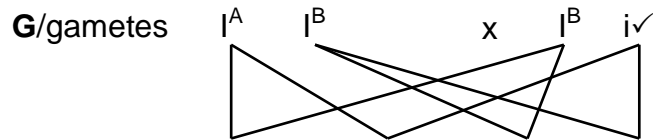
2.1	2.1.1	DNA profiling✓		(1)
	2.1.2	Jennie✓		(1)
	2.1.3	<ul style="list-style-type: none"> - Jennie’s DNA profile✓/ bands - matches the DNA profile/ bands of the sample✓from the crime scene 		(2)
	2.1.4	<ul style="list-style-type: none"> - Proof of paternity✓ - Tracing missing persons✓ - Identification of genetic disorders✓ - Establishing family relations✓ - Matching tissues for organ transplants✓ - Identifying dead persons✓/animals 	Any	(1) (5)
	(Mark first ONE only)			
2.2	2.2.1	The production of (genetically) identical organisms✓		(1)
	2.2.2	<ul style="list-style-type: none"> - A muscle cell contains all the genetic material✓ of the bull/ is diploid whereas - a sperm cell has only half of the genetic material✓/ is haploid 		(2)
	2.2.3	<ul style="list-style-type: none"> - To remove the genetic material of the cow✓ - so that only the genetic material from the (best meat producing) bull is present✓ 		(2)
	2.2.4	<ul style="list-style-type: none"> - To produce organisms with desired traits✓e.g. health; appearance; nutritious; yield; shelf-life; etc - Conservation of threatened species✓ - To create tissues/organs for transplant✓ 	Any	(1) (6)
	(Mark first ONE only)			

2.3 2.3.1 3✓/ Three (1)

- 2.3.2 - Complete dominance✓
 - The allele for blood group B/ I^B is dominant✓ and
 - the allele for blood group O/ i is recessive✓ (3)

2.3.3 P₁ Phenotype: Blood group AB x Blood group B✓
 Genotype: I^AI^B x I^Bi✓

Meiosis



F₁ Genotype: I^AI^B I^Ai I^BI^B I^Bi✓*

Phenotype: Blood group:
 AB; A; B✓*

P₁ and F₁✓

Meiosis and fertilisation✓

Compulsory 2*+ Any 4

OR

P₁ Phenotype: Blood group AB x Blood group B✓
 Genotype: I^AI^B x I^Bi✓

Meiosis

Fertilisation

Gametes	I ^A	I ^B
I ^B	I ^A I ^B	I ^B I ^B
i	I ^A i	I ^B i

1 mark for correct gametes
 1 mark for correct genotypes*

F₁ Phenotype: Blood group:
 AB; A; B✓*

P₁ and F₁✓

Meiosis and fertilisation✓

Compulsory 2*+ Any 4 (6)
(10)

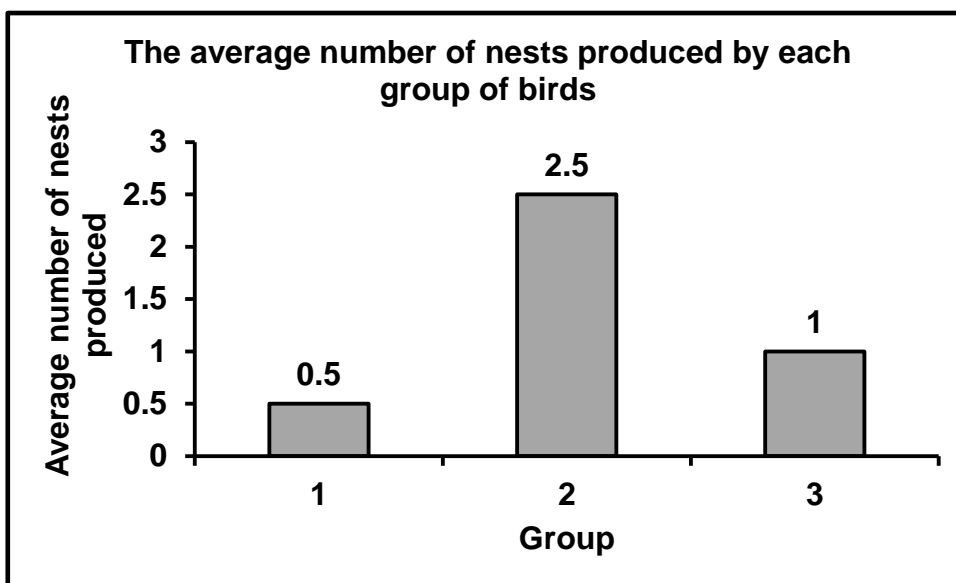
2.4	2.4.1	<ul style="list-style-type: none"> - A change in the sequence ✓ of - nitrogenous bases ✓ / nucleotides in a gene 	(2)
	2.4.2	Nigeria ✓	(1)
	2.4.3	$\frac{39\ 746}{305\ 733} \times 100 = 13\%$	(3)
	2.4.4	(a) dd ✓ (b) Dd ✓	(1) (1) (8)
2.5	2.5.1	Pedigree ✓ diagram	(1)
	2.5.2	(a) 6 ✓ (b) 1 ✓	(1) (1)
	2.5.3	$X^G X^g$ ✓ ✓	(2)
	2.5.4	Unaffected ✓ ✓ / without Goltz syndrome	(2)
	2.5.5	<ul style="list-style-type: none"> - Pilusa is affected ✓ / $X^G Y$ - Anju is unaffected ✓ / $X^g X^g$ - Males inherit the Y chromosome from Pilusa ✓ - and inherit X^g from Anju ✓ 	(4) (11) [40]



QUESTION 3

- 3.1
- Organisms produce a large number of offspring✓
 - There is variation✓ amongst the offspring
 - Some have favourable characteristics and some do not✓
 - When there is a change in the environmental conditions✓/ there is competition
 - organisms with favourable characteristics, survive✓
 - whilst organisms with unfavourable characteristics, die✓
 - The organisms that survive, reproduce✓
 - and pass on the allele for the favourable characteristic to their offspring✓
 - The next generation will therefore have a higher proportion of individuals with the favourable characteristic✓
- Any **(7)**
- 3.2
- 3.2.1 *Hominidae*✓ (1)
- 3.2.2
- Evidence such as tools✓ /weapons/ language/ artefacts
 - is used to show advances✓ in human development
- (2)
- 3.2.3 3 mya✓ (1)
- 3.2.4
- *H. ergaster* shows characteristics of both✓ *A. afarensis* and *H. heidelbergensis*
 - therefore it is a transitional✓ species
- (2)
- 3.2.5
- The fossils of *Australopithecus* were ONLY found in Africa✓
 - The fossils of *Homo habilis* were ONLY found in Africa✓
 - The OLDEST fossils of *Homo erectus* were found in Africa✓
 - The OLDEST fossils of *Homo sapiens* were found in Africa✓
 - This suggests that (the ancestors of) *Homo sapiens* originated in Africa✓*
- *1 Compulsory + Any 2 (9)**
- 3.3
- 3.3.1 (a) (Species-specific) courtship behaviour✓ (1)
- (b) Length of the (male long-tailed widowbird's) tails✓ (1)
- 3.3.2
- A larger sample size✓
 - increases the reliability✓ of the investigation
- (2)
- 3.3.3
- To serve as a control✓
 - so that it can be compared✓ with the other groups
 - and show that the tail length is the only factor that affects the results✓/improves the validity of the investigation
- Any (2)

3.3.4



(6)

Guideline for assessing the graph

CRITERIA	ELABORATION	MARK
Correct type of graph (T)	Bar graph drawn	1
Caption of graph (C)	Both variables included	1
Axes labels (L)	X- and Y-axis correctly labelled	1
Scale for X- and Y-axis (S)	- Equal space between bars and width of bars for X-axis and - Correct scale for Y-axis	1
Plotting of bars (P)	1 to 2 bars plotted correctly	1
	All 3 bars plotted correctly	2

3.3.5 The longer the (male long-tailed widowbird's) tail, the higher the mating success✓✓

OR

The shorter the (male long-tailed widowbird's) tail, the lower the mating success✓✓

(2)
(14)

- 3.4 3.4.1
- There was once one large continent✓ and
 - the common ancestor existed throughout this continent✓
 - When Madagascar separated✓
 - the common ancestor was found in both✓ regions (4)
-
- 3.4.2
- The common ancestor became separated into two **groups** by the ocean✓*
 - There was no gene flow between the two **groups**✓
 - Each **group** experienced different environmental conditions✓ and underwent natural selection independently✓
 - The individuals in each **group** became different✓ genotypically and phenotypically✓
 - to form the pottos and lemurs✓*
 - Eventually if the two groups are mixed again, they cannot interbreed✓/produce fertile offspring. ***2 Compulsory + Any 4** (6)
- (10)**
[40]

TOTAL SECTION B: 80



SECTION C

QUESTION 4

Location (P)

- The DNA is located in the nucleus✓
- and mitochondria✓ and
- chloroplasts✓

Any (2)

Structure (S)

- DNA is a double-stranded✓ molecule that
- forms a helix✓
- It is made up of nucleotides✓
- Each nucleotide has a deoxyribose sugar✓ molecule
- a phosphate group✓ and
- a nitrogenous base✓
- The bases are A, T, C and G✓
- which join to form complementary pairs✓ / (A to T and C to G)
- held by hydrogen bonds✓

Any (7)

DNA replication (D)

- The DNA (double helix) unwinds✓ and
- unzips✓ / hydrogen bonds break
- to form two separate strands✓
- Both DNA strands serve as templates✓
- to build a complementary DNA✓ / (A to T and C to G)
- using free (DNA) nucleotides✓ from the nucleoplasm
- This results in two identical (DNA) molecules✓
- Each molecule consists of one original strand and one new strand✓

Any (6)

Significance of DNA replication for mitosis (M)

- The genetic material/DNA is doubled✓
- so that each cell receives the same amount of DNA✓
- to ensure that all the daughter cells are (genetically) identical✓

Any (2)

Content: (17)
Synthesis: (3)
(20)

ASSESSING THE PRESENTATION OF THE ESSAY

Criterion	Relevance (R)	Logical sequence (L)	Comprehensive (C)
Generally	All information provided is relevant to the question	Ideas are arranged in a logical/cause-effect sequence	All aspects required by the essay have been sufficiently addressed
In this essay in Q4	Only information relevant to: - Location and structure of DNA - Process of DNA replication - Significance of DNA replication for mitosis There is no irrelevant information	The description for each of: - Location and structure of DNA - Process of DNA replication - Significance of DNA replication for mitosis Is logical and sequential	At least the following marks should be obtained for: - Location of DNA (P:1/2) - Structure of DNA (S:5/7) - Process of DNA replication (D:4/6) - Significance of DNA replication for mitosis (M:1/2)
Mark	1	1	1

TOTAL SECTION C: 20
GRAND TOTAL: 150