Education

KwaZulu-Natal Department of Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES P2

PREPARATORY EXAMINATION

SEPTEMBER 2017

MARKS: 150

TIME: 2½ Hours

N.B. 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. Make 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 1.1.9) in your ANSWER BOOK, for example 1.1.10 D.

1.1.1 Which type of cell is formed at the end of meiosis in human males?

A Sperm cell
B Ovum
C Neuron
D Somatic cell

1.1.2 Which ONE of the following differences between the skull of a human and the skull of a gorilla is correct?

	HUMAN SKULL	GORILLA SKULL
A	Large canines	Small canines
B	Gaps between the teeth	No gaps between the teeth
C	Cranial ridges present	Cranial ridges absent
D	Non-prognathous	Prognathous

1.1.3 The following are steps in the first stage of protein synthesis that occur in the nucleus:

(i) m-RNA is formed
(ii) One DNA strand is used as a template
(iii) Free RNA nucleotides are used
(iv) Two strands of DNA separate

Which ONE of the following combinations represents the correct sequence of steps during transcription of protein synthesis?

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

1.1.4 The table below provides information about the fossil skeleton of Karabo.

Characteristic	More like *H. habilis*	More like *A. africanus*	Intermediate between *H. habilis* and *A. africanus*
Cheekbones		✓	
Teeth and jaws	✓		
Skull shape and size		✓	
Cranial capacity		✓	
Brain shape			✓
Arms		✓	
Hands			✓
Pelvis			✓
Legs		✓	
Ankle	✓		
Foot			✓

Karabo is an example of a transitional fossil because it has characteristics …

A of older and more recent hominins as well as intermediate characteristics.
B of older hominins only.
C of more recent hominins only.
D that are not intermediate.

1.1.5 Two parents who do not have haemophilia have a son with haemophilia.

Which ONE of the following are the correct genotypes of the parents?

A Hh x Hh
B X^HX^h x X^HY^h
C X^HX^H x X^hY
D X^HX^h x X^HY

1.1.6 A somatic cell in a kangaroo has 16 chromosomes.

How many chromosomes and chromatids will be present in the cell during metaphase I?

A 8 chromosomes and 16 chromatids
B 16 chromosomes and 32 chromatids
C 8 chromosomes and 8 chromatids
D 16 chromosomes and 16 chromatids

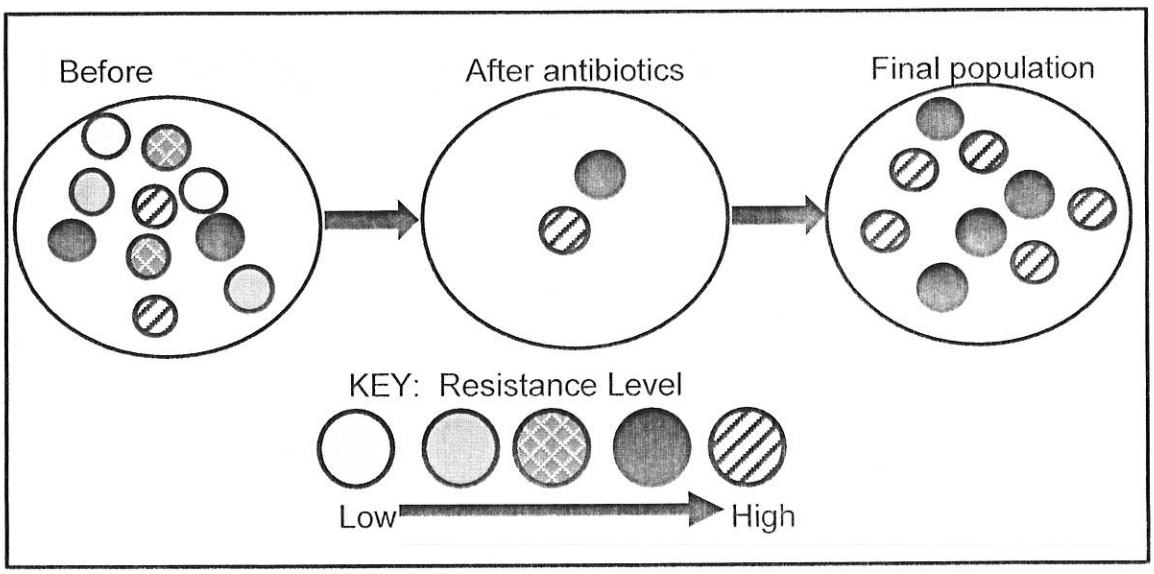
1.1.7 The passage below provides information about a plant called a Bee Orchid.

> *Ophrys apifera*, or the bee orchid, uses the physical appearance of its flowers to deceive pollinators. The lip of the flower resembles a female of a particular species of bee. Only the male bees of this species attempt to mate with the flower. During these mating attempts, the pollen attaches to the male bee.

The mechanism of reproductive isolation described in the passage is ...

A breeding at different times of the year.
B infertile offspring.
C adaptation to different pollinators.
D prevention of fertilisation.

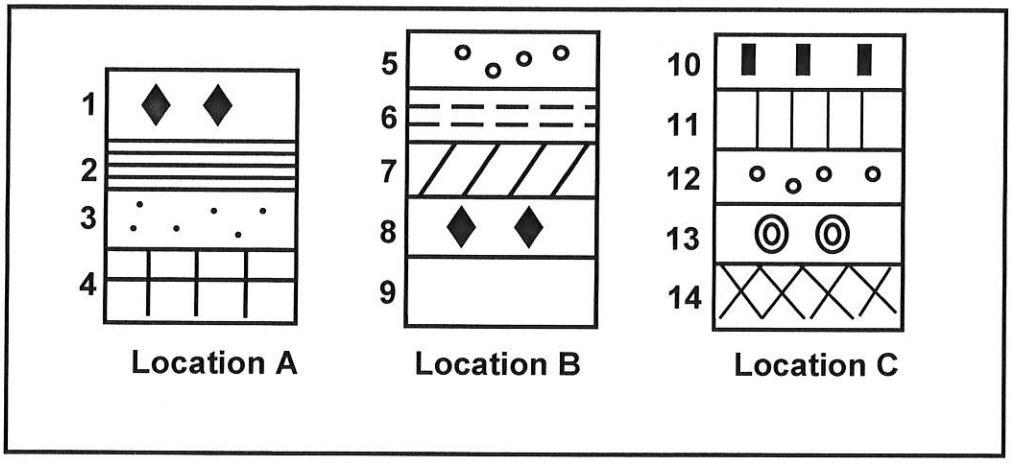
1.1.8 The diagram below represents a process that occurs when colonies of bacteria are treated with antibiotics.



The process represented in the diagram is ...

A the evolution of drug resistant bacteria.
B artificial selection.
C reproductive isolation.
D random mating.

1.1.9 The diagrams below represent the layers of rock found in three different locations, **A**, **B** and **C**. The symbols represent the fossils found in each layer.



Which of the following statements is correct regarding the three locations?

A The rock in layer **1** is older than those in layer **8**
B The rock in layers **5** and **12** are the same age
C The rock in layers **4**, **9** and **14** all formed at the same time
D The rock in layer **12** is younger than the rock in layer **10**

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 1.2.8) in the ANSWER BOOK.

1.2.1 The natural shape of the DNA molecule

1.2.2 A technique used to identify individuals on the basis of their DNA

1.2.3 An explanation of an observation that is supported by scientific evidence

1.2.4 A group of organisms of the same species that are living in the same habitat

1.2.5 A diagram that is used to represent the evolutionary relationships amongst different species

1.2.6 Organisms that have had genes from other organisms inserted into their genome

1.2.7 Undifferentiated cells that have the potential to form any body tissue

1.2.8 The current day distribution of living organisms in the world **(8)**

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	Produced X-ray pictures of DNA	A: Watson and Crick B: Franklin and Wilkins
1.3.2	Multiple alleles	A: Down syndrome B: Colour blindness
1.3.3	Alternating periods of rapid change and slow/no change	A: Punctuated equilibrium B: Cloning

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

1.4 Plants with yellow flowers were crossed with plants having red flowers. All the offspring had orange flowers.

Crosses were then done using different combinations of parental phenotypes to produce the F1 generation. The results are shown in the table below.

Cross Number	Results of the Cross
1	All **red**
2	All **orange**
3	52 **orange** and 51 **red**
4	22 variety **yellow**, 55 **orange**, 24 **red**

1.4.1 Name the type of dominance for flower colour represented by the above information. (1)

1.4.2 Use the letter **Y** for yellow and **R** for red to give the genotype for:

(a) Yellow flowers (1)

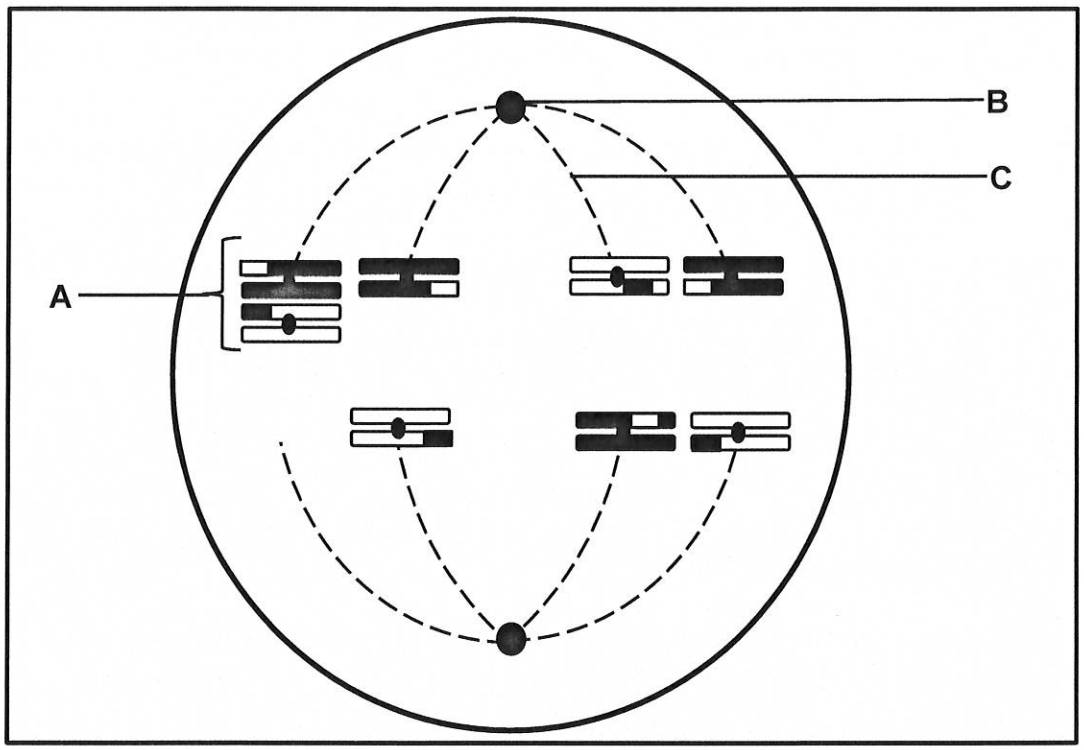
(b) Orange flowers (1)

1.4.3 Give the NUMBER of the cross where both parents are:

(a) Heterozygous (1)

(b) Homozygous (1)
(5)

1.5 The diagram below represents a phase of meiosis.



1.5.1 Provide labels for:

(a) **A** (1)

(b) **B** (1)

(b) **C** (1)

1.5.2 Name the phase of meiosis that is represented in the diagram. (1)

1.5.3 Name the process represented at **A** that may result in an abnormal gamete being formed. (1)

1.5.4 How many of the gametes produced from this cell will have one extra chromosome when meiosis is complete? (1)

1.5.5 List TWO ways in which genetic variation is introduced during meiosis. (2)
(8)

1.6 Read the following extract.

> A hypothesis states that all modern humans arose from a single group of *Homo sapiens* that migrated from Africa 50 000 years ago and spread throughout Europe and Asia over thousands of years.

1.6.1 Name the hypothesis referred to in the extract. (1)

1.6.2 Name the *Homo* sp. that migrated from Africa prior to that of *Homo sapiens*, around 1,8 million years ago. (1)

1.6.3 Name the *Homo* sp. that was the first to use tools. (1)

1.6.4 List TWO types of evidence that are used to support the hypothesis named in Question 1.6.1. (2)
(5)

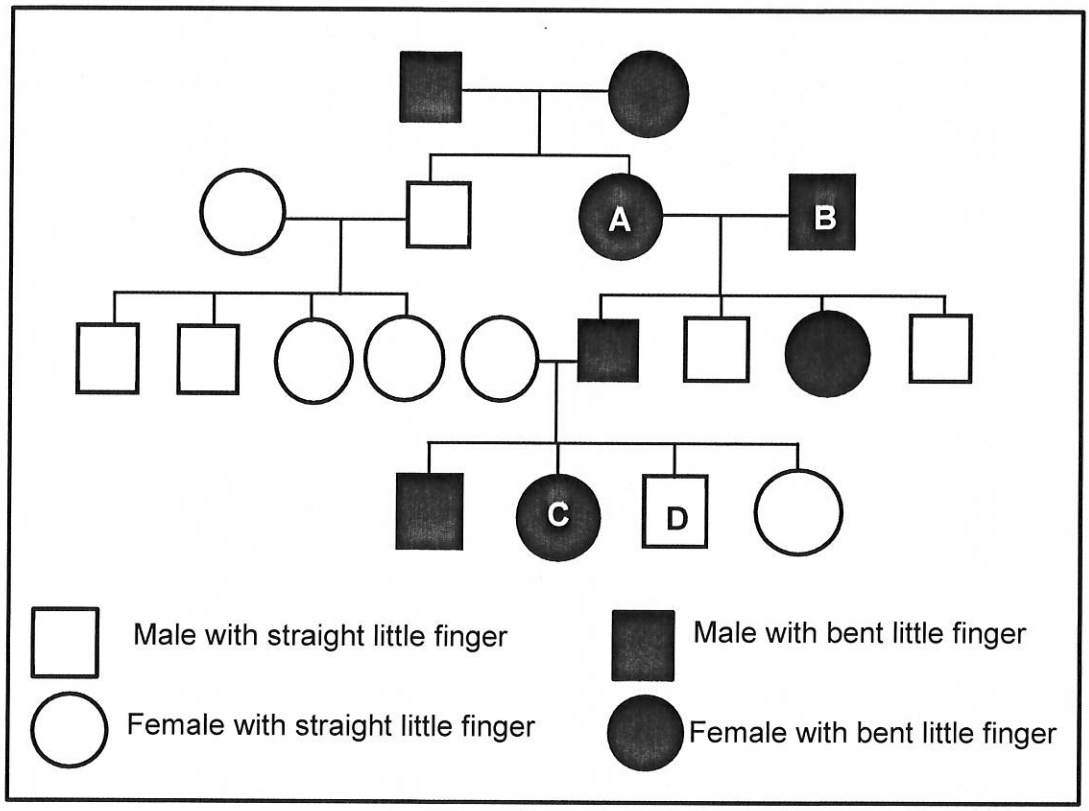
TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 A dominant allele causes the last joint of the little finger to bend inwards towards the fourth finger (**B**) and is called 'bent little finger'. The recessive allele (**b**) causes the little finger to be straight.

The pedigree diagram below shows the inheritance of a 'bent little finger' in a family.



2.1.1 Explain why individuals **A** and **B** are definitely heterozygous for this trait. (3)

2.1.2 Individual **C** has a child with a partner that has straight little fingers.

Use a genetic diagram to show the possible genotypes and phenotypes of the child. (6)
(9)

2.2 Describe the process of translation in protein synthesis. **(6)**

2.3 In fruit flies, normal wing is controlled by a dominant allele (**N**) and short wing is controlled by a recessive allele (**n**).

In addition, grey body colour is controlled by a dominant allele (**G**) and black body colour is controlled by a recessive allele (**g**).

A male fruit fly that is homozygous for both normal wings and grey body colour is mated with a female fruit fly that is heterozygous for wing length and that has a black body.

2.3.1 Give the genotypes of the:

(a) Male fly (1)

(b) Female fly (1)

(c) Possible gametes produced by the female fly (1)

2.3.2 The male fruit fly is then mated with a second female. The genotype of all the offspring is **NnGg.**

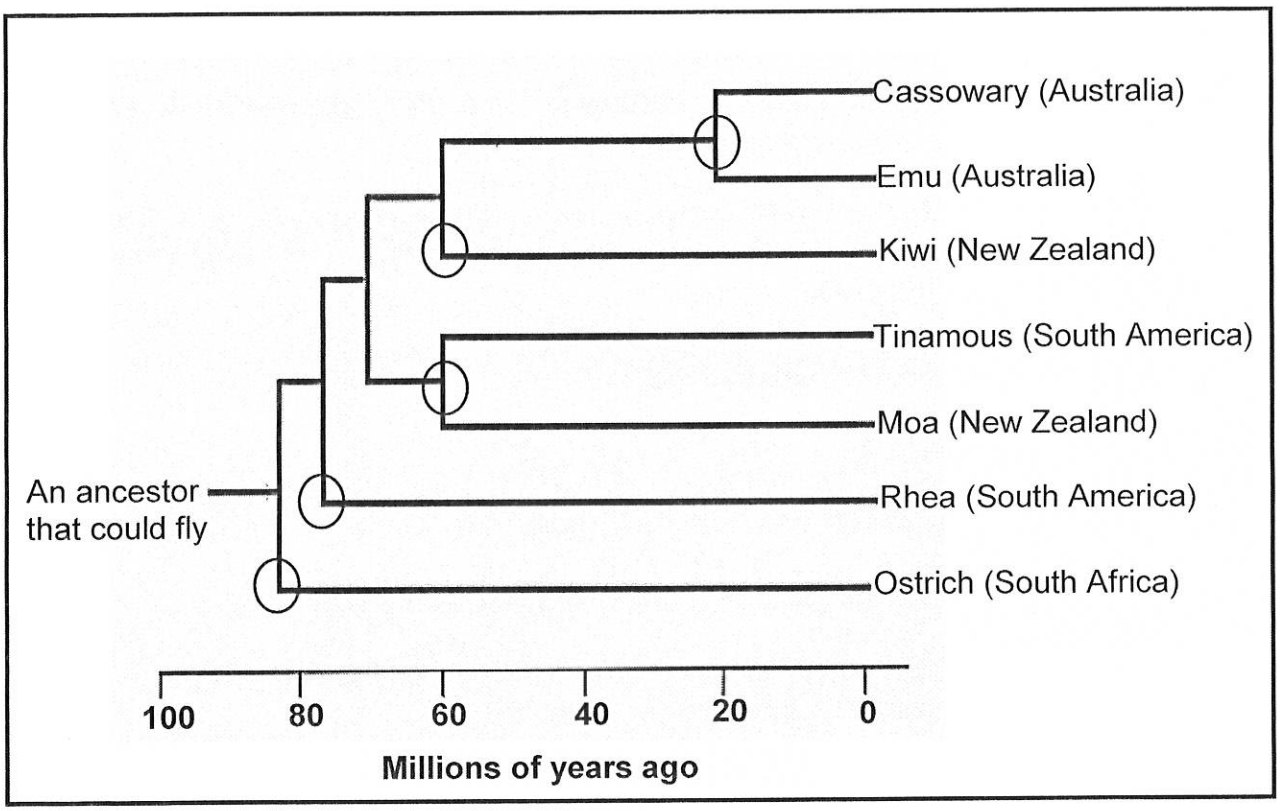
What was the genotype of the second female fruit fly? (2)
(5)

2.4 A particular species of snail that is active at night occurs in two varieties. One variety is white in colour while the other is dark brown. A student introduced equal numbers of each variety into her small garden. A year later she counted the number of each variety that remained in the garden and the results are recorded in the table below.

NUMBER OF WHITE SNAILS	NUMBER OF DARK BROWN SNAILS
20	136

Explain the above results in terms of natural selection. **(5)**

2.5 The phylogenetic tree below represents the possible evolution of flightless birds and the countries where these birds are found. The circled areas represent when each group of birds lost the ability to fly.



2.5.1 Which bird is most closely related to the Cassowary? (1)

2.5.2 Provide a reason for your answer to Question 2.5.1. (2)

2.5.3 How long ago did the first flightless birds appear on the earth? (2)

2.5.4 Describe the process of speciation that resulted in the evolution of the different species of flightless birds. (6)

2.5.5 Use Lamarck's 'Laws' to explain how the 'ancestor that could fly' in the diagram lost the ability to fly. (4)

(15)
[40]

QUESTION 3

3.1 Brassica plants have hairs on their leaves which reduce transpiration and thus increase their chances of survival.

An investigation was conducted to determine if artificial selection could be used to increase the number of Brassica plants with more than 25 hairs on their leaves.

The students carried out the following procedure:

- 180 *Brassica* plants of the same species were grown. This is the first generation. (No artificial selection)
- The number of hairs present on the edge of one mature leaf was counted per plant and the results recorded.
- The plants with the hairiest leaves, i.e. 25 or more hairs on the leaves were separated from the rest of the group and cross pollinated with each other.
- The seeds produced by these crosses were then germinated and allowed to grow into plants. 180 of these plants were selected to represent the second generation. (Artificially selected)
- The number of hairs present on the edge of one mature leaf from each of the second generation of plants was recorded.

The results of the first (without artificial selection) and second generations (with artificial selection) are shown in the tables below.

WITHOUT ARTIFICIAL SELECTION	
Number of hairs	**Number of plants**
26-30	12
31-35	8
36-40	6

WITH ARTIFICIAL SELECTION	
Number of hairs	**Number of plants**
26-30	45
31-35	30
36-40	14

3.1.1 Identify the:

(a) Independent variable (1)

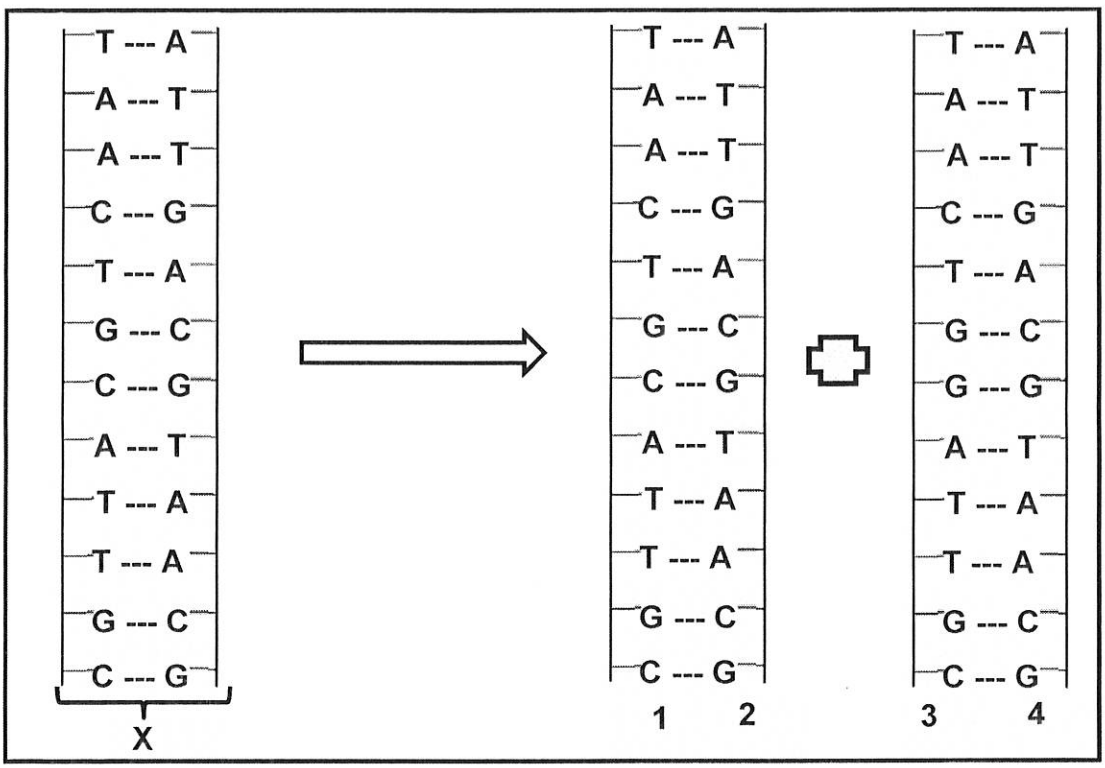
(b) Dependent variable (1)

3.1.2 State TWO ways in which the students ensured that this investigation was valid. (2)

3.1.3 State a suitable conclusion for this investigation. (2)

3.1.4 Explain why the characteristic of 'number of hairs' on the leaves is an example of continuous variation. (2)
(8)

3.2 The diagram below represents DNA replication.



3.2.1 Name the phase of the cell cycle during which DNA replication occurs. (1)

3.2.2 Describe the process of DNA replication. (6)

3.2.3 State TWO reasons why DNA replication is biologically important. (2)

3.2.4 A mutation has occurred on one of the replicated DNA molecules.

(a) Describe the mutation that has occurred. (2)

(b) Explain how this mutation will affect the structure of the protein that is formed. (4)
(15)

3.3 There are many trends that characterise the evolution of modern humans from their ancestors such as a change in brain size and the development of bipedalism.

The table below shows the brain size of various organisms.

Organism	**First appearance of organism**	**Average brain volume**
Ardipithecus ramidus	5-4 mya	325ml
Australopithecus africanus	3 – 2 mya	528ml
Homo habilis	2,2 – 1,6 mya	650ml
Homo erectus	2 – 0,4 mya	900ml
Homo sapiens	200 000 years ago	1500ml

3.3.1 How much larger is the brain volume of *Homo sapiens* compared to that of *Homo erectus*? Show ALL calculations. (2)

3.3.2 Which organism in the table does the fossil of *Littlefoot* belong to? (1)

3.3.3 Explain why the development of tool-making skills is associated with the development of a larger brain. (2)

3.3.4 Explain how scientists were able to estimate the brain volume of the early *Homo* species when they no longer exist on earth. (2)

3.3.5 Describe how each of the following changed in the development of bipedalism:

(a) Pelvis (2)

(b) Foramen magnum (2)

3.3.6 List THREE characteristics of the forelimb that *Homo sapiens* share with African Apes. (3)

3.3.7 Describe how genetic evidence can be used to support evolution. (3)

(17)

[40]

TOTAL SECTION B: 80

SECTION C

QUESTION 4

Describe the inheritance of blood groups and the use of blood groups in paternity testing.

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

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

TOTAL SECTION C: 20
GRAND TOTAL: 150

SECTION C

QUESTION 4

Inheritance of blood groups

- Blood groups in humans is controlled by one gene✓
- with three alleles✓/ I^A, I^B, i
- Each person inherits any 2 of the three alleles✓ from their parents
- I^A and I^B alleles are co-dominant✓
- I^A and I^B are dominant over the i allele✓/ i allele is recessive to both I^A and I^B

- Inheriting the I^A allele from both parents✓/ having the genotype I^AI^A
- or inheriting the I^A allele from one parent and i from the other parent✓/ having the genotype I^Ai
- results in blood group A✓

- Inheriting the I^B allele from both parents✓/ having the genotype I^BI^B
- or inheriting the I^B allele from one parent and i from the other parent✓/ having the genotype I^Bi
- results in blood group B✓

- Inheriting I^A from one parent and inheriting I^B from the other parent✓/having the genotype I^AI^B
- results in the AB blood group✓

- Inheriting the i allele from both parents✓/having the genotype ii
- results in blood group O ✓ Max 12

Use of blood groups in paternity testing

- If a genetic diagram shows that the mother and the man could produce a child with a particular blood group✓
- then he may be the father✓
- but we cannot say for sure that he is the father✓
- because there are many males with the same blood type✓

- If a genetic diagram shows that the mother and the man could not produce a child with a particular blood group✓
- then he is definitely not the father✓ Max 5

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 sequence.	All aspects of the essay have been sufficiently addressed.
In this essay in Q4	Only provided information relevant to: - The inheritance of blood groups - The use of blood groups in paternity testing No irrelevant information included.	Information on: - The inheritance of blood groups - The use of blood groups in paternity testing is presented in a logical and sequential manner.	At least the following marks should be obtained: - The inheritance of blood groups **8/12** - The use of blood groups in paternity testing **3/5**
Mark	1	1	1

TOTAL SECTION C: 20
GRAND TOTAL: 150

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LIFE SCIENCES P2

PREPARATORY EXAMINATION

SEPTEMBER 2017

MARKING GUIDELINE

NATIONAL SENIOR CERTIFICATE

GRADE 12

MARKS: 150

This marking guideline consists of 10 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. Memorandum 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 learners' 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.

SECTION A

QUESTION 1

1.1	1.1.1	A✓✓		
	1.1.2	D✓✓		
	1.1.3	C✓✓		
	1.1.4	A✓✓		
	1.1.5	D✓✓		
	1.1.6	B✓✓		
	1.1.7	C✓✓		
	1.1.8	A✓✓		
	1.1.9	B✓✓	(9 x 2)	**(18)**
1.2	1.2.1	Double helix✓		
	1.2.2	(DNA) profile✓/profiling		
	1.2.3	Theory✓		
	1.2.4	Population✓		
	1.2.5	Phylogenetic tree✓/cladogram		
	1.2.6	Genetically modified✓/genetically engineered/transgenic		
	1.2.7	Stem✓ cell		
	1.2.8	Biogeography✓	(8 x 1)	**(8)**
1.3	1.3.1	B only✓✓		
	1.3.2	None✓✓		
	1.3.3	A only✓✓	(3 x 2)	**(6)**
1.4	1.4.1	Incomplete✓ dominance		(1)
	1.4.2	(a) YY✓		(1)
		(b) YR✓		(1)
	1.4.3	(a) 4✓		(1)
		(b) 1✓/2		(1)
				(5)
1.5	1.5.1	(a) Homologous chromosomes✓/ bivalent		(1)
		(b) Centriole✓		(1)
		(c) Spindle fibre✓		(1)
	1.5.2	Anaphase I✓		(1)
	1.5.3	Non-disjunction✓		(1)
	1.5.4	Two✓/2		(1)
	1.5.5	Crossing over✓ Random arrangement of chromosomes at the equator✓/Independent assortment of chromosomes		(2)
		Mark first TWO only		**(8)**
1.6	1.6.1	Out of Africa✓ hypothesis		(1)
	1.6.2	(*Homo*) *erectus*✓/*H. erectus*		(1)
	1.6.3	(*Homo*) *habilis*✓/ *H. habilis*		(1)
	1.6.4	- Genetic evidence✓/Mitochondrial DNA - Fossil evidence✓		(2)
		Mark first TWO only		**(5)**
			TOTAL SECTION A:	**50**

QUESTION 2

2.1 2.1.1
- The parents have the dominant phenotype✓/have one dominant allele
- To have children with the recessive characteristic✓/bb
- The other allele of each parent must be recessive✓ (3)

2.1.2

P1	Phenotype	Bent little fingers	x	Straight little fingers✓	
	Genotype	Bb	x	bb✓	
Meiosis					
	G/gametes	B, b	x	b, b ✓	
Fertilisation					
F1	Genotype	Bb; Bb;		bb; bb ✓	
	Phenotype	bent little finger		straight little fingers✓	

P1 and F1✓
Meiosis and fertilisation✓

OR

P1	Phenotype	Bent little fingers	x	Straight little fingers ✓
	Genotype	Bb	x	bb ✓

Meiosis

Fertilisation

Gametes	b	b
B	Bb	Bb
B	bb	bb

1 mark for correct gametes
1 mark for correct genotypes

F1 Phenotype: bent little fingers; straight little fingers✓

P1 and F1✓
Meiosis and fertilisation✓ Any (6)
(9)

2.2
- The mRNA strand✓
- attaches to a ribosome✓
- Each tRNA molecule carrying a specific amino acid✓
- according to its anticodon✓
- matches up with the complementary codon✓ of the mRNA
- so that the amino acids are placed in the correct sequence✓
- Adjacent amino acids join together by peptide bonds✓
- to form a protein✓ Any **(6)**

2.3 2.3.1
(a) NNGG✓ (1)
(b) Nngg✓ (1)
(c) Ng; ng✓ (1)

2.3.2 nngg✓✓ (2)
(5)

2.4
- There is variation in the snail population✓/some are dark in colour and some are white
- The dark snails are camouflaged✓ / blend in with the garden at night
- The white snails are not camouflaged✓ / do not blend in with the garden at night
- Predators eat the white snails✓/the white snails die
- The dark snails survive✓
- and will reproduce✓/ pass this characteristic on to their offspring
- increasing the proportion of dark brown snails in subsequent generations✓

Any **(5)**

2.5 2.5.1 Emu✓ (1)

2.5.2
- They share a more recent✓
- common ancestor✓ (2)

2.5.3 Accept any answer in the following range: 82 - 84✓ mya✓ (2)

2.5.4
- Millions of years ago a population of ancestors that could fly was separated✓
- by the sea✓
- and there was no gene flow✓ between the different groups
- Each group was exposed to different environmental conditions✓
- and natural selection occurred independently✓ in each population
- The populations of birds on each continent became different✓ from each other
- both genotypically and phenotypically✓
- Even if the two populations were to mix again✓
- Eventually they could not interbreed to produce fertile offspring✓

Any (6)

2.5.5
- The flightless birds did not use their wings to fly✓
- and their wings became smaller✓/weaker
- and they therefore lost the ability to fly✓
- They then passed the characteristic of small/weak wings to their offspring✓
- which therefore were unable to fly✓ Any (4)

(15)

[40]

QUESTION 3

3.1 3.1.1 (a) Presence or absence of artificial selection✓ (1)

(b) The number of plants with more than 25 hairs on the leaves✓ (1)

3.1.2 The students:
- Used the same species of *Brassica*✓
- Used the same number of plants ✓
- Used one mature leaf from each plant✓
- Counted the hairs on the same part of the leaf✓ Any (2)

Mark first TWO only

3.1.3 Artificial selection can be used to increase the number of plants with 25 or more hairs on the leaves✓✓ (2)

3.1.4
- There is a range✓
- of intermediate phenotypes✓

OR

- The variation in the number of hairs✓
- occurs on a continuous scale✓/ continuum (2)

(8)

3.2 3.2.1 Interphase✓ (1)

3.2.2
- The DNA molecule unwinds✓
- and the hydrogen bonds break✓
- so that the two strands separate✓/unzip
- Free DNA nucleotides from the nucleoplasm✓
- join with complementary bases✓
- on the original strands which act as templates✓
- resulting in two identical DNA molecules✓ Any (6)

3.2.3
- It ensures that each daughter cell gets an identical copy of the DNA after mitosis✓
- It ensures that each daughter cell gets the correct number of chromosomes after mitosis✓ (2)

Mark first TWO only

3.2.4 (a)
- Guanine/G has attached to another guanine✓on strand 3
- instead of bonding with cytosine/C✓ (2)

(b)
- The code on the DNA has changed✓
- therefore the codons on the mRNA will be different✓
- and will code for a different amino acid✓
- The sequence of amino acids in the protein will be different✓
- resulting in the formation of a different protein✓ Any (4)

(15)

3.3 3.3.1 1 500 – 900✓ml = 600✓ml (2)

3.3.2 *Australopithecus africanus*✓ (1)

3.3.3
- Improved intelligence✓
- enables higher thinking✓/ problem solving/ creativity for making tools (2)

3.3.4
- Scientist have found fossil skulls✓
- and are able to measure the cranial capacity✓/volume of the cranium (2)

3.3.5 (a) The pelvis became wider✓ and shorter✓ (2)

(b) The foramen magnum moved✓ to a forward position✓ (2)

3.3.6
- Freely rotating arms✓
- Longer upper arms than forearms✓
- Rotation around the elbow joint✓
- Bare fingertips✓
- Nails instead of claws✓
- Opposable thumb✓

Mark first THREE only Any (3)

3.3.7
- If the sequence of genes✓/mutations on the DNA
- is very similar in different species✓
- then these species are closely related✓/shared a common ancestor (3)

(17)

[40]