Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE

GRADE 12

SEPTEMBER 2011

LIFE SCIENCES P1 MEMORANDUM

MARKS: **150**

This memorandum consists of 10 pages.

SECTION A:

QUESTION 1

1.1	1.1.1	B✓✓	(2)
	1.1.2	C✓✓	(2)
	1.1.3	A✓✓	(2)
	1.1.4	D✓✓	(2)
	1.1.5	C✓✓	(2)
1.2	1.2.1	Mitochondrial DNA✓/Mutant nucleotide in the mitochondrial DNA✓	(1)
	1.2.2	Recessive✓	(1)
	1.2.3	Polyploidy✓	(1)
	1.2.4	Genetic counsellor✓	(1)
	1.2.5	Mrs. Ples/Plesianthropus✓	(1)
1.3	1.3.1	B only✓✓	(2)
	1.3.2	None✓✓	(2)
	1.3.3	A only✓✓	(2)
	1.3.4	A only✓✓	(2)
	1.3.5	B only✓✓	(2)
1.4	1.4.1	Male partner 2	(1)
	1.4.2	The child has more matching bands✓ with mother and male partner 2 than with mother and male partner 1✓	(2)
	1.4.3	• For resolution of paternity test✓ • For diagnosis of diseases✓ • To identify an offender in a crime/apprehension of criminals✓ • To identify wild animals✓ • Developing cures for inherited disorders✓ • Identification of relatives✓ • Identification of badly burnt corpse✓, e.g. from plane crash and shack fire (Any 2)	(2)
	1.4.4	• Can be planted at the crime scene✓ • Not unique to an individual✓ e.g. identical twins • Human error that can lead to false results✓ • Lack of uniform testing standards and quality controls✓ • Is expensive✓ • Contamination of sample✓ • May reveal personal information✓ e.g. HIV/Aids status (Any 2)	(2)

1.5 1.5.1 Lamarck✓ (1)

1.5.2 A **hypothesis** is an educated guess to a well-framed question✓/is a proposed solution to a problem✓/is a term to describe an idea that still needs evidence to support it✓.
(Any 1 x1)

A **theory** is an explanation that can be supported by facts, laws and tested hypothesis✓/is the best explanation we have at present for a phenomena or events that can be observed✓.
(Any 1x1) (2)

1.5.3

Lamarck's theory	**Darwin's theory**
Based on the theory of use and disuse of organs.✓	Based on mechanisms of natural selection.✓
Individuals change because they want to change. (Deterministic theory)✓	Population changes because nature selects the best.✓
Acquired characteristics are passed on from parent to offspring.✓	Favourable characteristics are passed on from generation to another generation over a long time.✓
Variation of offspring brought about by individuals in the population changing.✓	Offspring showed variation from the moment of their production.✓
Individuals in the population change.✓	Population as a whole changes.✓

(Any 2x2=4)
Tabular column= 1 (5)

1.6 1.6.1 A group of organisms that includes humans and certain extinct primates✓ and represents a combination of human and primate features✓. (2)
1.6.2 Radiometric dating/absolute dating✓. (1)
1.6.3 Professor Lee Berger✓ (1)
1.6.4 Australopithecus sediba ✓ (1)
1.6.5

Homo habilis	**Homo sapiens**
Has ape-like head.✓	More rounded head. ✓
Protruding jaws. ✓	Less protruding jaws. ✓
Heavy brow ridges.✓	Flat brow ridges. ✓
Long, sloping face. ✓	A less sloping face. ✓
A less developed chin. ✓	A more developed chin.✓
Shorter body. (only 1,2 m tall) ✓	Increased skeletal size which would mean increased height.✓
Brain size (600-750*ml*). ✓	Brain size (1200*ml* – 1800 *ml*)✓
The jaws are less rounded.✓	More rounded jaws(gently curved jaws)✓

(Any 2x2) (4)
1.6.6 Sterkfontein.✓ (1)

TOTAL SECTION A: 50

SECTION B:

QUESTION 2

2.1 2.1.1 Allopatric speciation/Geographic speciation.✓ (1)

2.1.2 A mountain✓/River✓/sea✓/crator ✓ (Any 2) (2)

2.1.3 Mutation ✓ (1)

2.1.4
- Different gametes produced during meiosis✓/crossing over✓/random arrangement of chromosomes during metaphase1.✓
- Chance fertilisation of egg cells by sperm cells.✓
- Abnormal meiosis and mitosis.✓ (Any 3) (3)

2.1.5 Natural selection ✓ (1)

2.1.6 A group of organisms that have a large number of similar characteristics✓ and are able to interbreed✓ to produce viable✓ offspring which are fertile.✓ (Any 3) (3)

2.2 2.2.1 Probable death from malaria

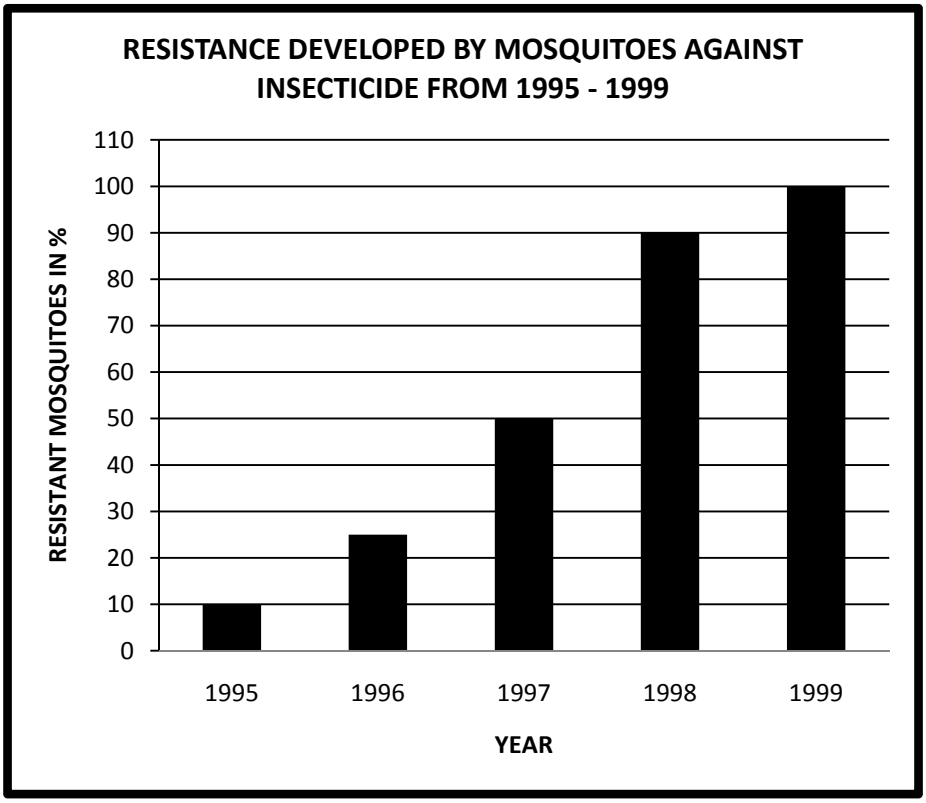
A: 400 x$\frac{10}{100}$ ✓= 40✓

B: 400 $x\frac{25}{100}$ ✓= 100✓

C: 400 $x\frac{50}{100}$ ✓= 200✓

D: 400 $x\frac{90}{100}$ ✓= 360✓ (8)

2.2.2



(7)

Rubric for the mark allocation of the graph	
Correct type of graph	1
Caption for the graph	1
Correct labels for X-axis	1
Correct labels for y-axis including unit	1
Appropriate scale for Y-axis	1
Drawing of graphs	1 - 1 to 3 bars drawn correctly 2 - 3 to 5 bars drawn correctly

NOTE: If the wrong type of graph is drawn: Marks will be lost for "correct type of graph".

2.2.3 When sprayed with insecticide, most of the mosquitoes die✓, but few insecticide resistant mosquitoes survive✓. The nature selects the best adapted✓ (insecticide resistant) mosquitoes and they breed rapidly and increase in numbers✓ since they have no competition because of the reduced population size.✓ (Any 4) (4)

[30]

QUESTION 3

3.1 3.1.1 Incidence of Down's syndrome✓ in children increases with an increase in maternal age.✓

OR

Incidence of Down's syndrome✓ in children is directly proportional to Maternal age✓

OR

Maternal age✓ has no effect on the incidence of Down's syndrome✓ in children. (2)

3.1.2
- Decide on the mode of data gathering. ✓
- Decide on sample size. ✓
- Data should be collected from all racial groups. ✓
- Data should be collected from both urban and rural settings.✓
- Design an appropriate or relevant recording sheet. ✓
- Decide on a date and time for data collection. ✓
- Prior permission should be obtained from the relevant official to gain access to hospital records. ✓
- Approach Down's syndrome foundation in South Africa for latest statistics regarding Down's syndrome.✓

Any other relevant answers (Any 1) (1)

3.1.3 $\frac{85}{145}$ ✓x100✓ = 59%✓ (3)

3.1.4 $\frac{15-10✓}{10✓}$ x100 = 50%✓ (3)

3.1.5 Incidence of Down's syndrome✓ in children increases with the maternal age✓/age of the mother. (2)

3.2 3.2.1 Meiosis✓ (1)

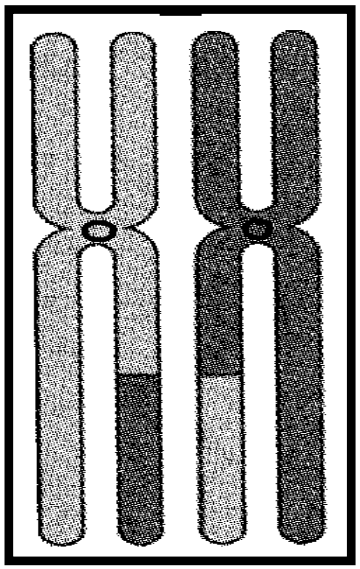
3.2.2 A: Homologous chromosomes/bivalent/tetrad.✓
B: Centromere✓
C: Chromatid✓
D: Chiasmata✓ (4)

3.2.3 Crossing over✓ (1)

3.2.4 1✓ $\rightarrow$ 3✓ $\rightarrow$ 2✓ (in the correct order) (3)

3.2.5

1 mark for the drawing.
1 mark for the correct shading.



(2)

3.3 3.3.1 Organism B✓ (1)

3.3.2 The forward position of foramen magnum✓ in organism B suggests bipedalism.

OR

Organism B walks in an upright position without the assistance of fore-arms.✓ (1)

3.3.3
- The hands became free for carrying food, tools and babies✓
- a better view of the surroundings in search of food and predators✓
- movement from place to place becomes more efficient✓
- faster cooling of the body, which was essential in their original hot tropical environment✓
- display of the male sex organs as part of courtship behaviour✓ (Any 2) (2)

3.3.4 The foot has long, curved toes✓ and opposable big toe✓ that sticks out to the sides, for gripping. (2)

3.3.5
- Longer upper arms that can move freely✓
- Larger brain✓
- Binocular and stereoscopic vision✓
- Fewer offspring ✓
- Ability to sit upright✓ (Any 2) (2)

[30]

TOTAL SECTION B: 60

SECTION C:

QUESTION 4

4.1 4.1.1 Pedigree is a record of an organism's ancestors.✓ (1)

4.1.2 Haemophilia occurs more frequently in the male than the female✓. According to the pedigree diagram, it is clear that only the male members suffer from this disorder. ✓ (1)

4.1.3 2 - Genotype - X^HX^h ✓; Phenotype - Carrier/non-haemophiliac✓
4 - Genotype - X^hY ✓; Phenotype - Haemophiliac✓ (4)

4.1.4 25%✓ (1)

4.2 4.2.1 GGU✓ ; AAC✓ ; UAU✓ ; GCU✓ (in the correct order) (4)

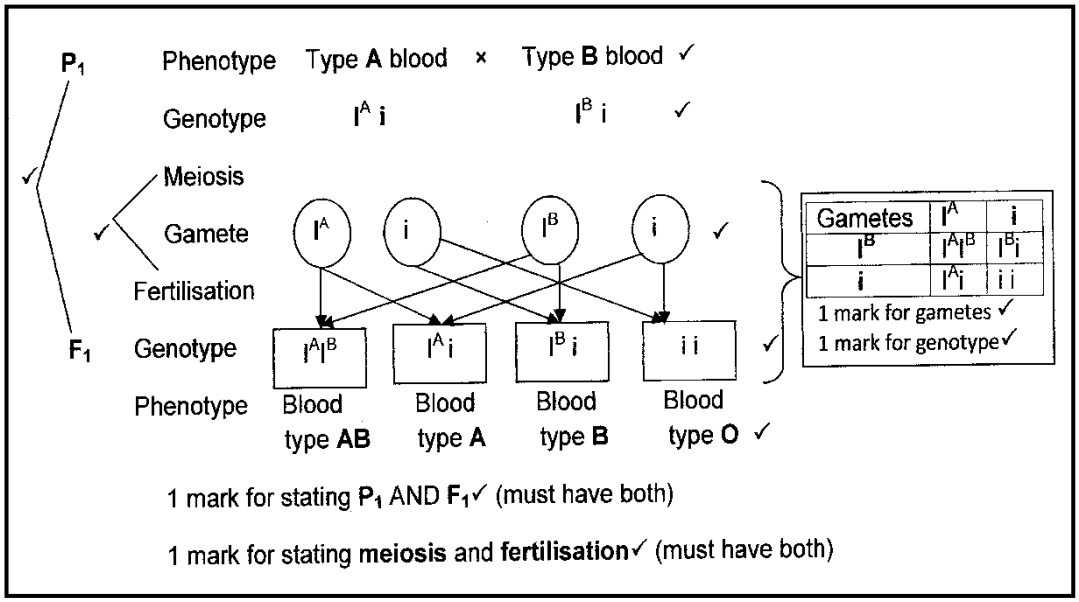
4.2.2 mRNA✓ (1)

4.2.3 Transcription✓ (1)

4.2.4 Nuclear radiation✓ (1)

4.2.5 Glycine✓ ; Asparaganine✓ ; Tyorsine✓ ; Alanine✓ (in the correct order) (4)

4.3



(7)

4.4 **What is genetically modified food?**
The introduction of new genes ✓ into a living organism in order to produce desired characteristics and eliminate undesirable traits✓. (2)

Advantages of genetic modification.
- improve taste and the nutritional value.✓
- become resistant to drought, cold, heat or alkaline conditions.✓
- enable plants to grow healthier, larger and to become mature quicker than the ordinary plants.(increased growth rate)✓
- to increase the shelf-life for the fresh produce.✓
- achieve higher yields from limited resources.✓
- increase resistance to diseases.✓
- obtain more predictable results.✓
- provide resistance to herbicides and pesticides.✓
- to give ability to survive in nitrogen poor soils.✓
- to develop frost resistance crops.✓
- to develop resistance to natural pests.✓
- enable crops to grow in any season of the year.✓
- to manufacture specific drugs or vitamins for human consumption.✓

(Any 4) (4)

Disadvantages/objections to genetically modification
Genetically modified crops:
- can be costly as it involves modern biotechnology which requires highly skilled people and sophisticated and expensive equipments.✓
- may cause allergic reactions in humans.✓
- could reduce biodiversity in a specific habitat.✓
- can easily be destroyed by new diseases.✓
- can interbreed with wild plants and spread to future generation. ✓
- may include a pesticide resistant gene that spread to wildlife with bad results.✓

Opposition
- organic farmers could have their crops contaminated with pollen from GM crops.✓
- new pathogens can be developed which may not be controlled by conventional or traditional methods.✓
- patented crops may lead to an increase in the price of seeds. This forces poor countries to depend on rich countries.✓
- plants modified for pesticide resistance could cross pollinate with wild relatives, creating “super weeds”✓
- unknown effects on human health can develop.✓
- Poor countries do not have the know-how or economic stability to deal with any of the possible shortcomings.(to implement bio-safety)✓

Ethical and moral concerns
- Main focus is on profit-making and not the well being of ordinary citizens.✓
- Regarded as unfair business practice.✓
- Ordinary citizens are regarded as guinea pigs to study the long term physiological effects.✓

- Scientists have no right to manipulate the laws and change the course of nature.✓
- Giant companies tend to decide and dictate food safety norms.✓
- Multinational corporations become the sole patent of the newly created organism and monopolise the market with the aim of accumulating wealth.✓
- Increases the dependency of poor countries on wealthier countries.✓
- Governments will not be able to implement the bio-safety protocol.✓
- Subsistent farmers become unable to compete with giant multinational biotechnology corporations and therefore, cease to exist.✓
- Huge amounts budgeted for genetic engineering could have been allocated for alleviating poverty, hunger, housing shortages and improving the standard of education and health sectors.✓

Religious and cultural objections:

- God is the creator of everything and manipulating genes and thereby creating new organisms is an act against the will of God.✓
- Vegetarians believe that consuming plant products that contains animal genes is an insult to their way of life and culture.✓ (Any 4)

Genetically modified food products should be labelled because:

- Every citizen has a right to information.✓
- Everyone has a right make their own choice.✓
- The consumers should not be misled.✓
- It gives the consumer an opportunity to compare GM products with naturally grown (organic) food products.✓
- It denies the public to challenge if a product has an undesirable effect on health.✓
- It curtails any deliberate attempt of companies to capitalise on public ignorance.✓
- Many people believe that absence of labels on GM product is a deliberate attempt to divert attention and discourage further evidence against the development of more GM products.✓
- Labelling prevents GM products being camouflaged with naturally grown food and priced the same.✓

Any relevant answer (Any 2) (2)
Synthesis (3)
[15]

Marks	Descriptions
3	Well structured – demonstrates insight and understanding of question
2	Minor gaps in the answer
1	Attempted but with significant gaps in the answer
0	Not attempted/nothing written other than question number

(3)
[15]

TOTAL SECTION C: 40

GRAND TOTAL: 150