



Province of the  
**EASTERN CAPE**  
EDUCATION

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 12**

**SEPTEMBER 2013**

**LIFE SCIENCES P1  
MEMORANDUM**

**MARKS: 150**

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This memorandum consists of 10 pages.

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## SECTION A

## QUESTION 1

- 1.1 1.1.1 A ✓✓  
 1.1.2 C ✓✓  
 1.1.3 B ✓✓  
 1.1.4 B ✓✓  
 1.1.5 B ✓✓  
 1.1.6 C ✓✓  
 1.1.7 A ✓✓  
 1.1.8 B ✓✓  
 1.1.9 D ✓✓  
 1.1.10 B ✓✓ (10 x 2) (20)
- 1.2 1.2.1 Allopatric (Geographical) speciation ✓  
 1.2.2 Natural selection ✓  
 1.2.3 Gonosomes / Sex chromosomes ✓  
 1.2.4 Phenotype ✓  
 1.2.5 Cloning ✓  
 1.2.6 Chiasma ✓  
 1.2.7 Polygenic inheritance ✓ (7 x 1) (7)
- 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 ✓✓  
 1.3.6 B only ✓✓  
 1.3.7 A only ✓✓ (7 x 2) (14)
- 1.4 1.4.1 Chromosomal non-disjunction/chromosomal non-separation ✓ (1)  
 1.4.2 Plants ✓ (1)  
 1.4.3 Polyploidy ✓ (1)  
 1.4.4 (a) 8 (diploid/2n) ✓ (1)  
 (b) 8 (diploid/2n) ✓ (1)  
 (c) 16 (tetraploid/4n) ✓ (1)  
 1.4.5 8 ✓ (1)  
 1.4.6 Production of:  
 • Larger plants ✓  
 • Larger flowers ✓  
 • Larger fruits ✓ (Mark first two only) (Any 2) (2)

TOTAL SECTION A: 50

## SECTION B

## QUESTION 2

- 2.1 2.1.1 Protein synthesis ✓ (1)
- 2.1.2 (a) The nucleus ✓ (1)  
 (b) The ribosome ✓ (1)  
 (c) Transcription ✓ (1)  
 (d) Translation ✓ (1)
- 2.1.3 (a) Proteins ✓ (1)  
 (b) Amino acids ✓ (1)  
 (c) Peptide bond ✓ (1)
- 2.1.4 (a) C ✓ A ✓ U ✓ (3)  
 (b) C ✓ C ✓ G ✓ (3)
- 2.1.5 3 ✓ (1)
- 2.1.6 P – Valine ✓  
 Q – Histidine ✓  
 R – Glycine ✓ (3)
- 2.2 2.2.1 “Three-parent” fertility treatment. ✓ / “Three parent *in vitro* fertilisation” ✓ (1)
- 2.2.2 Mitochondrial defect/Faulty mitochondrial DNA ✓ (1)
- 2.2.3 One in 6 500 children ✓ (1)
- 2.2.4
- The technique involves the replacement of defective mitochondria from the embryo. ✓
  - A new mitochondrion is inserted from a female donor ✓ so that the baby does not inherit defects from its mother.
  - This technique is carried out in the laboratory (*in vitro* process). ✓ (3)
- 2.2.5
- Fatal heart problems ✓
  - Liver failure ✓
  - Brain disorders ✓
  - Blindness ✓
  - Muscular weakness ✓ (Any 3 x 1) (3)
- 2.2.6
- The traditional concept of parenthood and family are challenged. ✓
  - Playing God. ✓
  - Future dilemma of the child explaining the concept of his/her parents. ✓
  - Unnatural process (against the nature) ✓ (Any other relevant answers) (3)

**[30]**

## QUESTION 3

- 3.1 3.1.1 A – *Australopithecus* ✓ (1)  
 B – *Homo habilis* ✓ (1)  
 C – *Homo erectus* ✓ (1)  
 D – *Homo neanderthalensis* ✓ (1)  
 E – *Homo sapiens* ✓ (1)
- 3.1.2
- Freely rotating (movable) long upper limbs ✓
  - Elbow joints allowing rotation of the forearm. ✓
  - Flat nails instead of claws ✓/ bare, sensitive finger tips. ✓
  - Flexible wrists that are capable of rotating at least 180°. ✓
  - Eyes in front ✓
  - Olfactory brain centres reduced ✓/reduced sense of smell ✓
  - Opposable thumbs for power grip and precision grip ✓
  - Larger brain ✓
  - Binocular vision ✓/stereoscopic vision
  - Sexual dimorphism ✓
  - Two teats ✓
  - Five fingers ✓
  - Production of fewer off-spring ✓
  - Upright posture ✓/bipedal (Any 5 x 1) (5)
- 3.1.3 Hominidae ✓ (1)
- 3.1.4
- Bipedalism ✓
  - A flat face ✓
  - Gently curved jaw line ✓
  - Dental formula  $\frac{2.1.2.3}{2.1.2.3}$  ✓
  - Larger brain (average brain size of 1 400 ml) ✓
  - Use of artificial language to communicate ✓
  - More pronounced chin ✓ (Any 3 x 1) (3)

**3.2 3.2.1 The scientific view**

- Is based on scientific observations, deductions and experiments. ✓
- Information is collected, analysed and conclusions are drawn. ✓
- Life evolved from the most basic organism. ✓
- Organisms have and are constantly changing. ✓
- Organisms evolved and adjusted to certain environments. ✓
- Theories are developed from scientific enquiries. ✓
- Scientists believe that organisms change to make them better adapted to their environment. ✓
- All scientists believe that organisms develop due to natural selection. ✓
- They believe that new groups are formed by evolution. ✓

(Any 2 x 1) (2)

**Creationist view**

- All living forms have been created by a supreme being. ✓
- Organisms that have been created have not changed since their creation. ✓
- Different forms of life were designed to function in particular settings. ✓
- In some cases the theories are in the form of stories. ✓
- Some accept organisms can change, but these changes take place to make them better adapted to their environment. ✓
- Some accept that new species can be formed by natural selection due to variation. ✓
- They do not believe that new groups can be formed by evolution. ✓
- They accept the absolute truth as written in sacred texts of the religion to which they adhere. ✓
- They accept moral, ethical and philosophical interpretations. ✓
- Some have taken the view that evolution can be disproved by the idea of irreducible complexity. ✓

(Any 2 x 1) (2)

- 3.2.2
- Repeat the experiment several times. ✓
  - Do test under the same conditions. ✓
  - Experiment is done with a larger sample. ✓ **(Mark first two only)**
- (Any 2 x 1) (2)
- 3.2.3 To inform people of their findings so that they can critique ✓ / verify their findings ✓ / use it for future research ✓ / acknowledge ownership of the findings. ✓ (Any 2 x 1) (2)
- 3.2.4
- Paleontology ✓
  - Comparative anatomy ✓
  - Biogeography ✓
  - Molecular biology and genetics ✓
  - Comparative embryology ✓
- (Any 3 x 1) (3)
- 3.3 3.3.1 Spraying DDT over a period of 32 weeks ✓ will eradicate the mosquito population. ✓ (2)
- 3.3.2 There was a substantial increase in the population of mosquito over 32 weeks. ✓ **OR** DDT had no effect on the size of mosquito population. ✓ (1)
- 3.3.3 Mosquitoes developed resistance against DDT ✓ over a period of 32 weeks. ✓ (2)

**[30]****TOTAL SECTION B: 60**

SECTION C

QUESTION 4

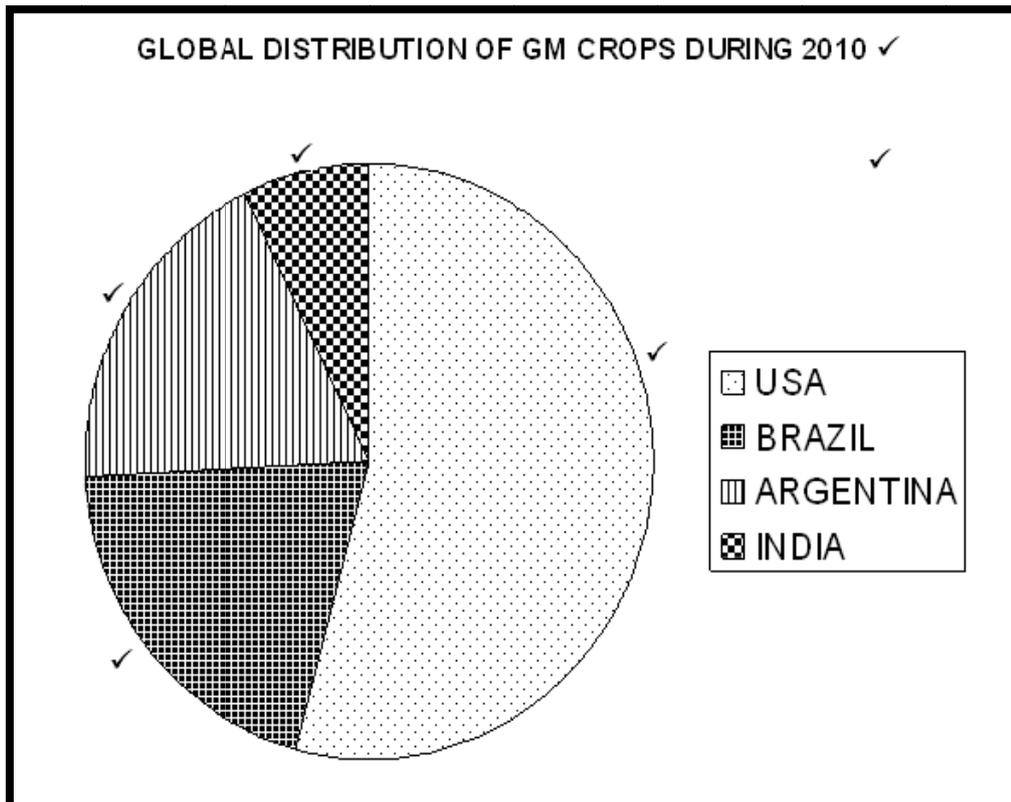
4.1 4.1.1 USA (United States of America) ✓ (1)

4.1.2 Increasing trend ✓ (1)

4.1.3  $25 - 21 = 4$  ✓  
 $\frac{4}{25} \times 100 = 16\%$  ✓ (3)

4.1.4 • Emergence of super weeds ✓  
• Environmental pollution ✓ (Any 1 x 1) (1)

4.1.5  $\frac{67}{124} \times 360 = 194,5^\circ$   
 $\frac{25}{124} \times 360 = 72,6^\circ$   
 $\frac{23}{124} \times 360 = 67,8^\circ$   
 $\frac{9}{124} \times 360 = 26,1^\circ$  } 2 marks

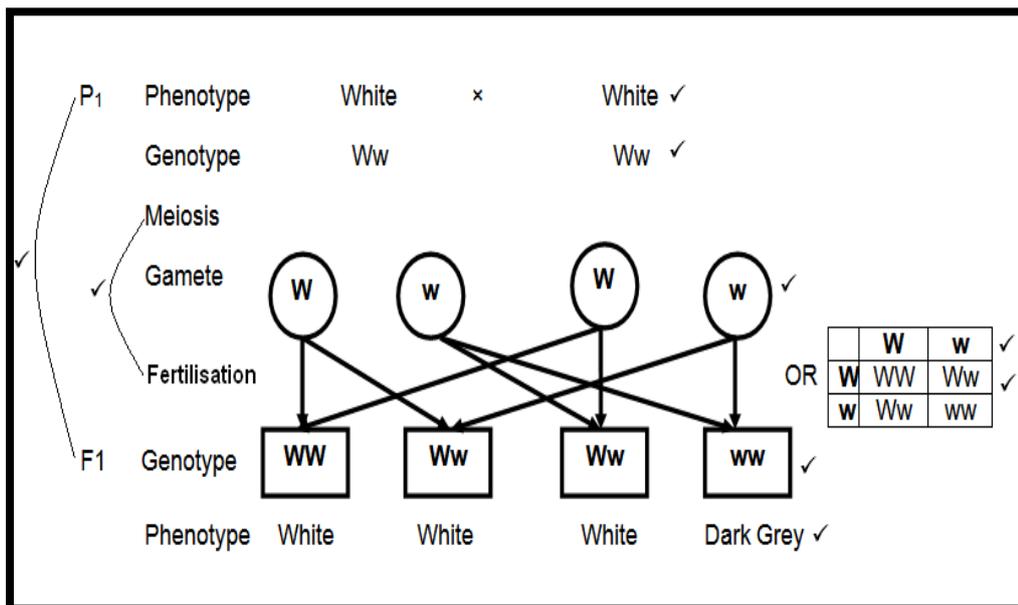


**Mark allocation of the graph**

Calculations/Working to determine the correct proportions	2 Marks: All four calculations correct 1 Mark: 1 to 3 calculations correct
Correct type of graph (pie chart)	1
Title of graph	1
Proportions accurate for each sectors/slice labelled key	4 Marks: All four sectors correct. (Use transparency template) (1 x mark / sector)

(8)

## 4.2 4.2.1



(Any 6 x 1) (6)

## 4.3 “Out of Africa hypothesis”

Scientists believe that *Homo sapiens* probably evolved in Southern Africa and spread throughout the rest of the world. ✓ This means that all the people on planet earth evolved from an ancestral population that originated only 200 000 years ago. ✓

About 1,9 million years ago, long before *Homo sapiens* appeared, some *Homo erectus* ✓ moved out of Africa using the land bridge which developed when the sea-level dropped during the ice ages. ✓ They probably moved beyond Africa and then spread across the grasslands of Asia and Europe. ✓

About 100 000 years ago, *Homo sapiens* also moved out of Africa ✓ but this population could not survive. ✓ A second migration of *Homo sapiens* ✓ happened about 70 000 years ago. ✓ This group and their descendants moved into Middle-East and spread over the rest of the world, replacing the other *Homo sapiens* that had migrated earlier. ✓

About 50 000 years ago they reached South Asia ✓ and about 40 000 years ago they reached Australia. ✓ They probably reached America via Asia only 20 000 years ago. ✓

(Any 3 x 1) (3)

**Genetic evidence in support “Out of Africa hypothesis”**

- DNA is used for the purpose of tracing ancestry. ✓
- A search is made for mutations since individuals who have the same mutation must share the same common ancestor. ✓ (markers of descent).

(a) **DNA from the Y-chromosomes**

Since the major part of Y-chromosomes of males does not undergo crossing over with its mismatched X chromosomes, ✓ DNA on the Y-chromosomes is passed on from father to son without being mixed with nucleotides from the mother. ✓ Therefore, mutant nucleotides can be traced from son to father to grandfather to great grandfather and so on. ✓ This way, our male ancestry can be traced. ✓ By using mutant nucleotides on Y-chromosomal DNA as markers of descent, scientists have traced the lineage of every man alive to a common ancestor who lived in East Africa about 60 000 years ago. ✓ (Any 4 x 1) (4)

(b) **Mitochondrial DNA**

DNA found in the mitochondria is known as mitochondrial DNA. Since the mitochondrial DNA ✓ of the sperm cell does not fuse with that of the egg cell, ✓ it is passed on from mother to child. ✓ By following mutant nucleotides in mitochondrial DNA, ✓ scientists are able to trace the female line of descent. ✓

Analysis of mitochondrial DNA leads to an ancestral female who lived in East Africa, around 150 000 years ago. ✓ Scientists believe other species of humans were also present at this time. However, those other species all became extinct and our species (*Homo sapiens*) was the only one that survived. ✓ (Any 4 x 1) (4)

On the basis of DNA analysis, scientists believe that from East Africa early humans migrated across the continent of Africa. Then they moved out of the continent through north-east Africa.

(c) **Fossil evidence to support “Out of Africa” theory**

The world’s oldest ✓ and richest concentration of fossils of early humans ✓ has been found in Africa. Some of examples of excavated fossils of early humans found in Africa are listed below: (2)

- 6 to 7 million years old bipedal primates, *Sahelanthropus tchadensis* ✓ found in Chad. ✓
- Little Foot ✓ is a 3,9 to 4,2 million years old fossil discovered in the Sterkfontein Caves. ✓
- Lucy ✓ is a 3,2 million years old fossil discovered in Ethiopia. ✓

- Taung Child (*Australopithecus Africans*) ✓, a 2,6 to 2,8 million old fossil found in the Northern Cape. ✓
- Mr. Ples (*Australopithecus africanus*) ✓ 2,6 million years old fossil found in the Sterkfontein Caves. ✓
- Kromdraai (*Paranthropus robustus*) ✓ was also discovered in Sterkfontein. ✓
- 1,2 to 2,2 million years old fossil *Paranthropus boisei* ✓ was discovered in Tanzania. ✓
- Fossil of *Homo habilis* ✓ was discovered in Tanzania. ✓
- Florisbad man (an earlier *Homo sapiens*), ✓ a 250 000 year fossil was discovered in the Free State. ✓ (Any 2 examples) (4)

**No flow chart will be credited as an essay.**

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

Synthesis (3)

**TOTAL SECTION C: 40**  
**GRAND TOTAL: 150**