Province of the
EASTERN CAPE
EDUCATION

# NATIONAL SENIOR CERTIFICATE

## GRADE 12

## SEPTEMBER 2015

# LIFE SCIENCES P2 MEMORANDUM

**MARKS: 150**

This memorandum consists of 9 pages.

## SECTION A

## QUESTION 1

| | | | | |
|---|---|---|---|---|
| 1.1 | 1.1.1 | A ✓✓ | | |
| | 1.1.2 | C ✓✓ | | |
| | 1.1.3 | A ✓✓ | | |
| | 1.1.4 | D ✓✓ | | |
| | 1.1.5 | C ✓✓ | | |
| | 1.1.6 | A ✓✓ | | |
| | 1.1.7 | A ✓✓ | | |
| | 1.1.8 | D ✓✓ | | |
| | 1.1.9 | D ✓✓ | | |
| | 1.1.10 | B ✓✓ | (10 x 2) | (20) |
| 1.2 | 1.2.1 | Protein ✓ | | |
| | 1.2.2 | tRNA ✓ / transfer RNA | | |
| | 1.2.3 | Hydrogen bond ✓ | | |
| | 1.2.4 | Punctuated equilibrium ✓ | | |
| | 1.2.5 | Ribosome ✓ | | |
| | 1.2.6 | Uracil ✓ | | |
| | 1.2.7 | Transcription ✓ | | |
| | 1.2.8 | Ribose ✓ | (8 x 1) | (8) |
| 1.3 | 1.3.1 | A only ✓✓ | | |
| | 1.3.2 | B only ✓✓ | | |
| | 1.3.3 | B only ✓✓ | | |
| | 1.3.4 | A only ✓✓ | | |
| | 1.3.5 | A only ✓✓ | | |
| | 1.3.6 | Both A and B ✓✓ | (6 x 2) | (12) |
| 1.4 | 1.4.1 | A diagrammatic representation ✓ showing the relationship among different species. ✓ | | (2) |
| | 1.4.2 | *Australopithecus afarensis* ✓ | | (1) |
| | 1.4.3 | *Homo sapiens* ✓ */ modern man* | | (1) |
| | 1.4.4 | *Australopithecus africanus*, ✓ *Homo habilis,* ✓ *Homo erectus* ✓ | (Any 2 x 1) | (2) |
| | 1.4.5 | (2,0 ✓ – 0,5 ✓) = 1,5 ✓million years ago **(Accept 1.8 and 1.9 for *Homo erectus*)** | | (3) |
| | 1.4.6 | *Homo erectus* ✓ | | (1) |

**TOTAL SECTION A: 50**

## SECTION B

## QUESTION 2

2.1 2.1.1 Metaphase I – chromosomes come as homologous pairs to the equator
Metaphase II – individual chromosomes to the equator ✓ (1)

2.1.2 18 min ✓ (1)

2.1.3 (28 min – 18 min) ✓= 10 min ✓ (2)

2.2 2.2.1 It refers to all the DNA ✓ in an organism including its genes. ✓ (2)

2.2.2 It is a section of DNA with a specific sequence of bases ✓ that acts as the instructions for producing a specific protein. ✓ (2)

2.2.3 Regulate chromosomal structure. ✓
Regulate protein synthesis. ✓/ Regulate the quantity and quality of proteins made. (2)

2.2.4 (a) 95% ✓ (1)

(b) It is made of repeated sequence/non-coding regions and its function is not known. ✓ (1)

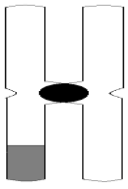
2.2.5 Number of genes on the other chromosomes
= 24 000 ✓ – (2 965 + 231) ✓
= 20 804 ✓ genes
**OR**
= 24 000 ✓ – 3 196 ✓
= 20 804 ✓ genes (3)

2.3 2.3.1 A – chromosome ✓
B – centromere ✓
C – chromatid ✓
D – chiasma ✓/chiasmata (4)

2.3.2 Crossing over ✓ (1)

2.3.3 It introduces genetic ✓ variation. ✓ (2)

2.3.4 **CHROMOSOME AFTER CROSSING OVER**

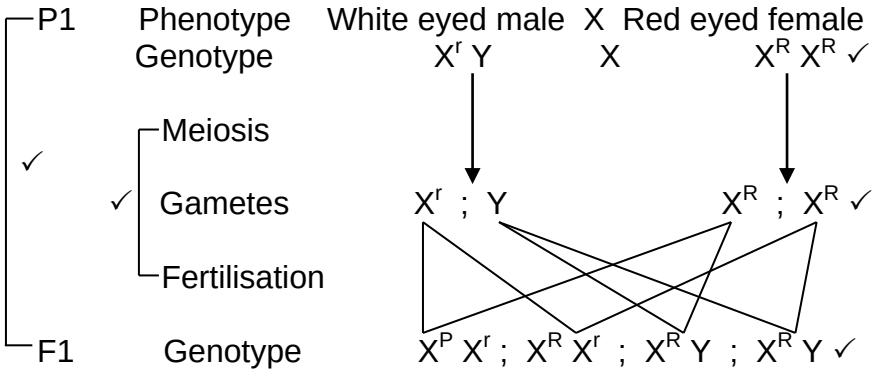


A double stranded chromosome ✓/
Strands joined by a centromere
Evidence of crossing over shown ✓
Heading ✓
(3)

2.4 2.4.1 It transports amino acid / lysine to the mRNA. ✓
UUC (anticodon) joins with AAG (codon) on mRNA. ✓
Amino acid / lysine (on the tRNA) form a peptide bond with the polypeptide chain ✓ to form a protein.
tRNA is now free to return to cytoplasm (to join with other lysine / amino acid). ✓ (Any 3 x 1) (3)

2.5 2.5.1 Large number of eggs produce ✓, therefore improves reliability ✓
simple nutrient medium ✓ therefore reduces costs ✓
markings on male/size of female ✓therefore easy to identify ✓
short generation time ✓ therefore results obtained quickly ✓
(Any 2 x 2) (4)

2.5.2



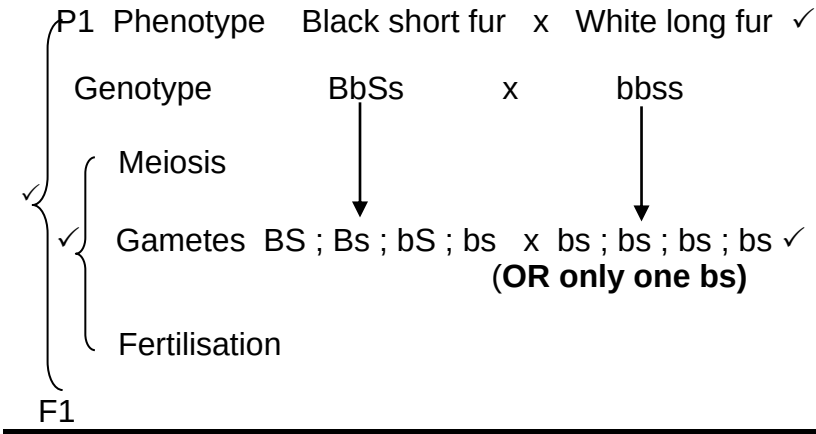

Phenotype: 2 Red eyed females and 2 Red eyed males ✓ (6)

2.5.3 Males have one allele ✓(not chromosome), so only one recessive allele will show the phenotype, ✓ but females need two recessive alleles to show in the phenotype. ✓ (Any 2 x 1) (2)

**[40]**

## QUESTION 3

3.1 3.1.1




| Gametes | **BS** | **Bs** | **bS** | **bs** |
|---|---|---|---|---|
| **bs** | BbSs | Bbss | bbSs | bbss |
| **bs** | BbSs | Bbss | bbSs | bbss |
| **bs** | BbSs | Bbss | bbSs | bbss |
| **bs** | BbSs | Bbss | bbSs | bbss |

✓✓ (6)

3.1.2 Phenotype: 1 black short fur ; 1 black long fur ✓
1 white short fur ; 1 white long fur ✓ (2)

3.2 3.2.1 Most people ✓ have a poor knowledge about GM foods. ✓
Only a very small percentage believed that they are knowledgeable about GM foods. ✓ (3)

3.2.2 People in the rural areas would have been even less knowledgeable ✓ about GM foods because they are less educated and have less access to knowledge. ✓ (2)

OR

People in rural areas are often farmers ✓ so they will be more knowledgeable about GM foods. ✓

3.2.3 Plants that have had their genes manipulated ✓ to make it better in some ✓ way. (2)

3.2.4 (a)
- It will allow for the production of medication or other resources more cheaply. ✓
- Pest resistant and drought resistant plants can be produced. ✓
- Crop yield can be increased ✓ thereby increasing food security.
- The shelf life of fruit and vegetable can be increased ✓ thus decreasing wastage. (Any 2 x 1) (2)

(b)
- Initially it is an expensive process. ✓ The money could be used for other needs.
- We are interfering with nature as we are trying to play God. ✓
- It may have potential health impacts. ✓
- We are unsure of long term effects of using GMOs. ✓

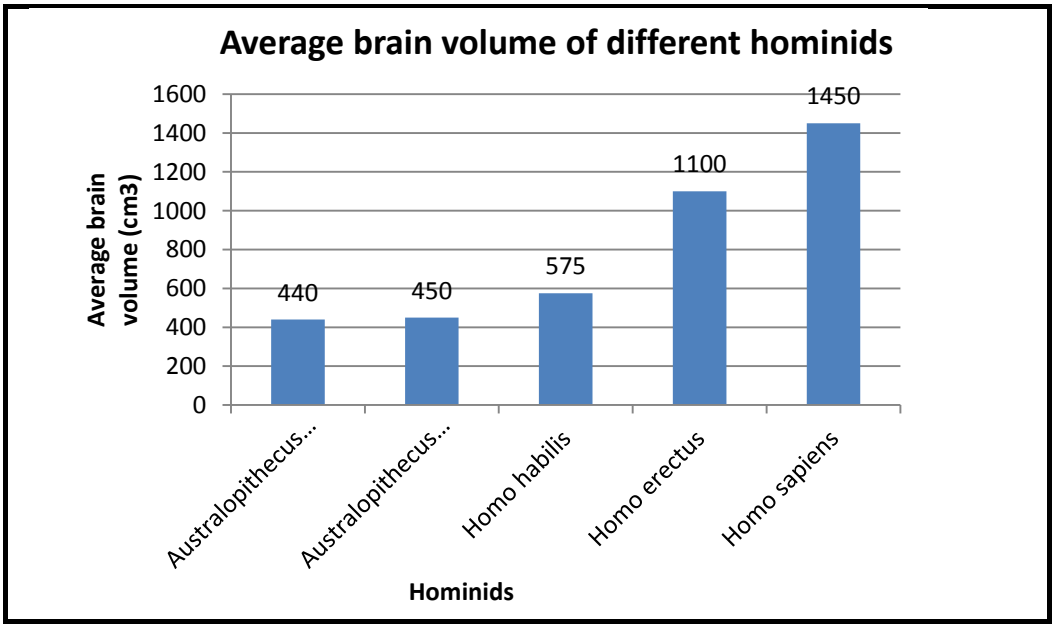
(Any 2 x 1) (2)

3.3 3.3.1 Skull B ✓ (1)

3.3.2
- Sloping forehead ✓
- Pronounced brow ridge ✓
- No chin ✓
- Protruding jaw ✓/ prognathous
- Large cranium ✓
- Sloping face ✓
- Small cranium ✓ (Any 5 x 1) (5)

3.4
- Free hands for carrying tools, food, and weapons. ✓
- Reduced exposure of their bodies to the hot sun. ✓/ Faster cooling of body.
- Able to see further distances, ✓ for example over long grass.
- Easier to gather food from bushes or low branches. ✓
- Upright posture is easier for hunting or fighting. ✓
- Increased height to intimidate predators. ✓
- Easier carrying of offspring. ✓
- A more efficient way of moving than swinging through the trees. ✓
- Display of male sex organs for courtship behaviour. ✓ (Any 3 x 1) (3)

3.5.1




Guideline for the assessing of the graph

| | |
|---|---|
| Correct type of graph | 1 |
| Title of graph | 1 |
| Correct label and scale X-axes | 1 |
| Correct label and scale Y-axes | 1 |
| Plotting of points | 1 mark: 1 to 3 points plotted correctly<br>2 marks: all 5 points plotted correctly |

**NOTE:**
If the wrong type of graph is drawn, 1 mark will be lost for:
- 'Correct' type of graph.

If labels of the axes are transposed then 2 marks will be lost for:
- 'Correct' label and scale for X-axis and Y-axis

3.5.2 *Homo sapiens* ✓ (1)

3.5.3 The earlier hominids had a smaller brain volume. ✓
As the hominids evolved, ✓ their brain volume increased. ✓ (3)

3.5.4
- Process large amount of information ✓
- Development of speech ✓/ communication
- Higher intelligence ✓
- Quickly process information ✓
- Complex behaviour ✓ (Any 2 x 1) (2)

**[40]**

**TOTAL SECTION B: 80**

## SECTION C

## QUESTION 4

4.1 **Mutation**

- Mutation is any change in the genetic composition✓ of an organism,
- resulting in a change in the structure ✓/sequence of the genes.
- It influences the process of protein synthesis, ✓ resulting in a different protein ✓ or no protein being formed.
- This will then lead to different characteristics ✓ in the organisms resulting in a change in the phenotype.✓ Max. 6

**Effects of mutation**

- The effects can be harmful ✓/lethal, harmless ✓/neutral and useful/beneficial. ✓
- It is the useful mutations and sometimes the harmful mutations that contribute to genetic variation ✓ and
- if mutation occurs in a somatic cell, ✓ no genetic variation occurs ✓ because these are not inherited.
- If the mutation occurs in a gamete ✓ or in cells that give rise to gametes, it will be transmitted to the offspring, i.e. it must be an inheritable variation for a particular trait ✓ Max. 4

**Natural selection**

- Mutations form evolution.
- Organisms produce a large number of offspring, ✓ with a great deal of variation amongst the offspring. ✓
- Some of these will have favourable characteristics ✓/ advantages to survive a changing environment. ✓
- This will enable them to survive ✓
- Then they pass on ✓their favourable characteristics to their offspring, which will then result in the formation of a new species ✓/speciation occurs.
- Those with the unfavourable ✓ characteristics will not adapt ✓ to the environment and die out ✓/extinct. Max. 7 (17)

## Marking guidelines for the essay

| Criterion | Relevance (R) | Logical sequence (L) | Comprehensive (C) |
|---|---|---|---|
| **In this essay** | Only information relevant to mutation, its effects and influence on variation and natural selection are given. | Logical flow in answer with regards to how mutation leads to variation, and natural selection explained. | Mutation, its effect and influence on variation and natural selection are explained with a clear understanding. |
| **Mark** | 1 | 1 | 1 |

Synthesis (3)

**TOTAL SECTION C: 20**
**GRAND TOTAL: 150**