



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS

LIFE SCIENCES P2

2016

MEMORANDUM

MARKS: 150

This memorandum consists of 11 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.
19. **Changes to the memorandum**
No changes must be made to the memoranda without consulting the provincial internal moderator who in turn will consult with the national internal moderator (and the Umalusi moderators where necessary).
20. **Official memoranda**
Only memoranda 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 | A✓✓ | | |
| | 1.1.2 | D✓✓ | | |
| | 1.1.3 | C✓✓ | | |
| | 1.1.4 | B✓✓ | | |
| | 1.1.5 | A✓✓ | | |
| | 1.1.6 | C✓✓ | | |
| | 1.1.7 | D✓✓ | | |
| | 1.1.8 | C✓✓ | | |
| | 1.1.9 | C✓✓ | | |
| | 1.1.10 | C✓✓ | (10 x 2) | (20) |
| 1.2 | 1.2.1 | Dihybrid✓ | | |
| | 1.2.2 | Biodiversity✓ | | |
| | 1.2.3 | Foramen magnum✓ | | |
| | 1.2.4 | Population✓ | | |
| | 1.2.5 | Hypothesis✓ | | |
| | 1.2.6 | Haemophilia✓ | | |
| | 1.2.7 | Extinction✓ | | |
| | 1.2.8 | Gene✓ | | |
| | 1.2.9 | Bipedalism✓ | (9 x 1) | (9) |
| 1.3 | 1.3.1 | Y✓ and Z✓ (Mark first TWO only) | | (2) |
| | 1.3.2 | Y – Tau✓ Z – Chaka✓ | | (2) |
| | 1.3.3 | I ^A I ^A ✓ I ^A i✓ (Any order) | | (2) (6) |
| 1.4 | 1.4.1 | (a) 46✓ | | (1) |
| | | (b) 44✓ | | (1) |
| | | (c) 2✓ | | (1) |
| | 1.4.2 | 23✓ | | (1) |
| | 1.4.3 | Male✓ | | (1) |
| | | | | (5) |

| | | | |
|-----|-------|--|-------------|
| 1.5 | 1.5.1 | (a) Prophase I✓ | (1) |
| | | (b) Metaphase II✓ | (1) |
| | 1.5.2 | (a) Centriole✓ | (1) |
| | | (b) Nuclear membrane✓/(nucleus) | (1) |
| | | (c) Homologous pair✓/Bivalent | (1) |
| | 1.5.3 | (a) - Forms spindle✓✓fibres | (2) |
| | | (b) Carries genetic✓/hereditary material | (1) |
| | 1.5.4 | Haploid✓ | (1) |
| | 1.5.5 | Crossing over✓ | (1) |
| | | | (10) |
| | | TOTAL SECTION A: | 50 |

SECTION B

QUESTION 2

- 2.1 2.1.1 (a) White✓fur (1)
 (b) Black✓fur (1)
 2.1.2 (a) 1✓ and 3✓ (2)
 (b) 1✓ (1)
 (Mark first TWO only)
 (Mark first ONE only)

2.1.3

| | | | | |
|---|----------------------|------------------------|-----|--------|
| P₁ | Phenotype | Black | X | White✓ |
| | Genotype | BB | X | bb✓ |
| <i>Meiosis</i> | G/gametes | B, B | X | b, b✓ |
| <i>Fertilisation</i> | F₁ | | | |
| | Genotype | Bb; | Bb, | Bb; |
| | Phenotype | All black *0✓%white | | |
| P ₁ and F ₁ ✓ Meiosis and fertilisation✓ | | | | |

(*compulsory mark + 5)

OR

| | | | | | | | | | | | | | |
|---|-----------|--|---|--------|---------|---|---|---|----|----|---|----|----|
| P₁ | Phenotype | Black | X | White✓ | | | | | | | | | |
| | Genotype | BB | X | bb✓ | | | | | | | | | |
| <i>Meiosis</i> | | | | | | | | | | | | | |
| <i>Fertilisation</i> | | <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>Gametes</td> <td>B</td> <td>B</td> </tr> <tr> <td>b</td> <td>Bb</td> <td>Bb</td> </tr> <tr> <td>b</td> <td>Bb</td> <td>Bb</td> </tr> </table> | | | Gametes | B | B | b | Bb | Bb | b | Bb | Bb |
| Gametes | B | B | | | | | | | | | | | |
| b | Bb | Bb | | | | | | | | | | | |
| b | Bb | Bb | | | | | | | | | | | |
| | | 1 mark for correct gametes 1 mark for correct genotypes | | | | | | | | | | | |
| F₁ | Phenotype | All black *0✓% white | | | | | | | | | | | |
| P ₁ and F ₁ ✓ Meiosis and fertilisation✓ | | | | | | | | | | | | | |

(* compulsory mark + 5) (6)
(11)

- 2.2 2.2.1 The two types of shrimp/ type A and B did not belong to the same species✓/ were different species
(Mark first ONE only) (1)
- 2.2.2 - Individuals that belong to the same species✓ are able to interbreed✓
- the two types of shrimps did not mate with each other✓ and therefore were unable to interbreed✓ Any (1 x 2) (2)
(Mark first ONE only)
- 2.2.3 To ensure that the results would be reliable✓ (1)
(4)
- 2.3 - The original population is separated✓ into two populations
- by a **geographical barrier**✓
- There is no gene flow✓/no interbreeding between the populations
- Each population is exposed to different environmental conditions✓
- Natural selection occurred independently✓ in each population
- and the individuals of each population became different from each other✓ over time
- genotypically and phenotypically✓
- Even if the two populations were to mix again✓
- they would not be able to reproduce with each other✓ Any (5)

- 2.4 2.4.1 - Ponds 1 and 2 should have identical✓environmental✓/
biological/physical conditions/examples
- Equal numbers✓ of predatory fish✓ in both ponds (Any 1 x 2) (2)
- 2.4.2 (a) The **type** of predators✓ (1)
(b) The **number** of spots✓ (1)
- 2.4.3 - As a control✓/to compare the results between the ponds.
- To ensure that any changes that occurred✓ were due to the
- presence of the predator✓/independent variable (3)
- 2.4.4 - There is variation✓ amongst the male guppies
- Some have more spots✓
- while others have fewer spots✓
- The ones that have more spots attract predators✓
- and are eaten✓/killed by predators
- The ones with fewer spots survived✓ and reproduced
- to pass the gene for fewer spots on to the next generation✓

Over a period of time, pond 1 with predators had guppies with
fewer spots Any (5)
(12)
- 2.5 2.5.1 Phylogenetic tree✓ (1)
- 2.5.2 4✓ (1)
- 2.5.3 (a) *Paranthropus*✓ (1)
(b) *Ardipithecus*✓ (1)
(c) *Paranthropus robustus*✓ (1)
- 2.5.4 Mrs Ples✓
Taung Child✓
Little Foot✓
(**Mark first ONE only**) (Any 1) (1)
- 2.5.5 *H. habilis*✓
H. erectus✓
H. naledi✓
(**Mark first TWO only**) (Any 2) (2)
(8)
[40]

QUESTION 3

- 3.1 3.1.1 High yield✓
Short stem✓ (2)
- 3.1.2 hT✓ (1)
(Mark first ONE only)
- 3.1.3 HHtt✓, Hhtt✓ (2)
(Mark first TWO only)
- 3.1.4 Does not break easily in windy conditions✓/to carry a bigger yield/
easier to harvest Any (1)
- 3.1.5 The plant breeder must cross✓ plants of variety A (HHtt) with
plants of variety A✓(HHtt) (2)
(8)
- 3.2 **T** ✓

| | Lamarckism | | Darwinism |
|---|---|---|---|
| 1 | Variation of the offspring occurs when individuals in the population change✓ | 1 | Variation in the offspring is inherited✓ |
| 2 | Change occurs because of adaptation to the environment✓/Law of use and disuse/ deterministic theory | 2 | Natural selection – individuals best suited to the environment survive✓ |
| 3 | Individuals in the population change✓ | 3 | The population as a whole changes✓ |
| 4 | Acquired characteristics are inherited by offspring✓ | 4 | Characteristic are passed on from generation to generation to enable individuals to survive in the environment✓ |

(Mark first THREE only)**(Any (3 x 2) + 1 for table) (7)**

- 3.3 3.3.1 - Olfactory brain centres reduced✓/ reduced sense of smell
 - Eyes in front✓/ Binocular vision / stereoscopic vision
 - Eyes with cones✓/ colour vision
 - Freely rotating arms✓
 - Elbow joints allowing rotation of forearm✓
 - Flat nails instead of claws✓/ bare, sensitive finger tips
 - Opposable thumbs✓/precision grip
 - Bipedal✓/ upright posture / foramen magnum in a more forward position
 - Sexual dimorphism✓/ distinct differences between males and females
 - Two teats✓
 - Parts of the brain that process information from the hands and eyes are enlarged✓
 - Long **upper** arms✓
 - Large brains✓ / skulls compared to their body mass
 - Five digits per limb✓ Any (5)
- (Mark first FIVE only)**
- 3.3.2 (a) More curved spine✓/S-shape in humans
 less curved✓/ C-shaped in apes (2)
- (b) **Short and wide**✓ pelvis in humans
long and narrow✓ pelvis in apes (2)
- 3.3.3 - Canines/teeth have changed from large to small✓✓
 - This is due to a change from eating raw✓ food
 - to eating cooked✓food (4)
(13)
- 3.4 3.4.1 2✓ (1)
- 3.4.2 (a) Albino female✓ (1)
- (b) Aa✓✓ (2)
- 3.4.3 (a) 50%✓ (1)
- (b) 25%✓ (1)
(6)
- 3.5 - A gene mutation affects the sequence of nitrogen bases✓/
 change in the individual nitrogen bases
 - in DNA✓
 - This changes transcription✓
 - Resulting in a changed mRNA✓/codon
 - which changes the order of the code✓ on the DNA and the RNA/the order
 of the nitrogen bases
 - A different amino acid✓ may be coded for
 - by tRNA✓ leading to the formation of a different protein (Any 6) **(6)**
[40]

TOTAL SECTION B: 80

SECTION C**QUESTION 4****Location, structure and function**

- The DNA is located in the nucleus✓/chromosome/genes/mitochondria
- DNA is a nucleic acid✓
- It has a double✓stranded
- helix✓ configuration
- consisting of building blocks called nucleotides✓
The three components of a nucleotide are as follows:
- Nitrogenous bases✓
- Phosphate portion✓
- Deoxyribose sugar portion✓(in DNA)
- 4 nitrogenous bases are A,T,C,G✓ of DNA:
- adenine (A) bonds with thymine (T)✓
- cytosine (C) bonds with guanine (G)✓
- by hydrogen bonds✓
- Sections of DNA carry hereditary✓ information
- DNA contains coded information for protein synthesis✓

Max (10)

Replication✓

- The double helix unwinds✓
- Double stranded DNA unzips✓
- as the weak hydrogen bonds break✓
- Each original DNA strand serves as a template✓
- Free nucleotides✓build
- a new DNA strand✓onto each of the original DNA strands
- by attaching to their complementary✓nitrogenous bases/(A to T, and C to G)
- this results in two identical✓DNA molecule

Max (7)

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. | Answered all aspects required by the essay in sufficiently detail. |
| In this essay in Q4 | All the information provided is relevant to the location, structure, functions of DNA and the replication process. There is no irrelevant information | The information given regarding the location, structure, functions of the DNA and the replication process is arranged in a logical and sequential manner. | At least the following marks should be obtained for: - location, structure and functions of the DNA (7/10) - DNA replication (4/7) |
| Mark | 1 | 1 | 1 |

TOTAL SECTION C: 20
GRAND TOTAL: 150