basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

# NATIONAL SENIOR CERTIFICATE

## GRADE 12

## LIFE SCIENCES P2

## FEBRUARY/MARCH 2016

## MEMORANDUM

**MARKS: 150**

**This memorandum consists of 9 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 or diagrams are given instead of descriptions**
   Candidates will lose marks.

8. **If sequence is muddled and links do not make sense**
   Where the 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 | D✓✓ | | |
| | 1.1.2 | D✓✓ | | |
| | 1.1.3 | C✓✓ | | |
| | 1.1.4 | C✓✓ | | |
| | 1.1.5 | D✓✓ | | |
| | 1.1.6 | B✓✓ | | |
| | 1.1.7 | B✓✓ | | |
| | 1.1.8 | B✓✓ | | |
| | 1.1.9 | D✓✓ | | |
| | 1.1.10 | A✓✓ | (10 x 2) | **(20)** |
| 1.2 | 1.2.1 | Complete dominance✓ | | |
| | 1.2.2 | Cloning✓ | | |
| | 1.2.3 | Population✓ | | |
| | 1.2.4 | Stereoscopic✓/Binocular | | |
| | 1.2.5 | Hominidae✓/Hominids | | |
| | 1.2.6 | Down syndrome✓/ trisomy 21 | | |
| | 1.2.7 | Transcription✓ | | |
| | 1.2.8 | Homologous✓ | | |
| | 1.2.9 | Locus✓ | | |
| | 1.2.10 | Discontinuous variation✓ | (10 x 1) | **(10)** |
| 1.3 | 1.3.1 | Both A and B✓✓ | | |
| | 1.3.2 | Both A and B✓✓ | | |
| | 1.3.3 | B only✓✓ | (3 x 2) | **(6)** |
| 1.4 | 1.4.1 | (a) Big✓ and green✓ fruit | | (2) |
| | | (b) BG, Bg, bG, bg✓✓ | | (2) |
| | 1.4.2 | 0✓ %✓ | | (2) |
| | | | | **(6)** |
| 1.5 | 1.5.1 | W Cell membrane ✓/ Plasmalemma | | (1) |
| | | X Homologous chromosomes✓/Bivalent | | (1) |
| | 1.5.2 | (a) 4✓ | | (1) |
| | | (b) 2 ✓ | | (1) |
| | 1.5.3 | D✓ | | (1) |
| | 1.5.4 | Y Holds the sister chromatids together✓ | | |
| | | Z Pulls chromosomes/chromatids to the poles✓ | | (2) |
| | 1.5.5 | Telophase II✓ | | (1) |
| | | | **TOTAL SECTION A:** | **(8)** |
| | | | | **[50]** |

## SECTION B

## QUESTION 2

2.1 2.1.1 (11/100) ✓ x 2000✓ = 220✓ (3)

2.1.2 - Repeat✓the investigation
- Use a larger sample size✓/more dogs
***(Mark first TWO only)*** Any 2 (2)

2.1.3 The breed of the dogs✓
***(Mark first ONE only)*** (1)

2.1.4 - The disorders are inherited ✓
- and therefore does not change with age✓ (2)

2.1.5 Autosomal recessive inheritance causes most of the genetic disorders in dogs✓✓ (2)
**(10)**

2.2.

**$P_1$** Phenotype: Rough hair x Smooth hair✓
Genotype: Hh x hh✓

*Meiosis*

**G**/gametes: H h x h h✓

*Fertilisation*

**$F_1$** Genotype: Hh Hh hh hh ✓

Phenotypic ratio: 1 rough hair : 1 smooth hair ✓

$P_1$ and $F_1$✓
Meiosis and fertilisation✓ Any 6

**OR**

**$P_1$** Phenotype: Rough hair x Smooth hair✓
Genotype: Hh x hh✓

*Meiosis*

*Fertilisation*

| Gametes | H | h |
|---|---|---|
| h | Hh | hh |
| h | Hh | hh |

1 mark for correct gametes
1 mark for correct genotypes

**$F_1$** Phenotypic ratio: 1 rough hair : 1 smooth hair ✓

$P_1$ and $F_1$✓
Meiosis and fertilisation✓ Any 6 **(6)**

2.3 2.3.1 (a) DNA✓ (1)

(b) Ribosome✓ (1)

2.3.2 (a) 2✓ (1)

(b) 5✓ (1)

(c) 7✓ (1)

2.3.3
- The mRNA attaches to the ribosome✓
- When each codon✓ of the mRNA
- matches with the anticodon ✓on the tRNA
- the tRNA brings the required amino acid to the ribosome✓
- When the different amino acids are brought in sequence✓
- adjacent amino acids are linked by peptide bonds✓
- to form the required protein✓/polypeptide Any 4 (4)

2.3.4 (a) CCT✓✓ (2)

(b) CCU✓✓ (2)

2.3.5

| DNA | RNA |
|---|---|
| Has deoxyribose✓ sugar | Has ribose✓ sugar |
| Has nitrogen base thymine (T)✓/ A, C, G and T | Has nitrogen base uracil(U)✓/ A, C, G and U |

***(Mark first TWO only)*** (2 x 2) (4)
**TABLE NOT REQUIRED**

**(17)**

2.4.1 Embryos✓/Blastocysts
Umbilical cord✓/ Placenta
Bone marrow✓
***(Mark first ONE only)*** Any 1 (1)

2.4.2
- Stem cells are undifferentiated ✓
- and have the potential to develop into any type of cell✓
- to replace the affected/defective cells✓causing the disorder (3)

2.4.3
- To produce ova✓ which could be used
- in cases where females do not have functional ovaries✓
- and are therefore infertile✓ and thereby
- allowing them to have children✓ Any 3 (3)

**(7)**
**[40]**

## QUESTION 3

3.1 3.1.1
- The DNA molecule unwinds✓
- Hydrogen bonds between the two strands break✓/ the molecule unzips
- Each strand serves as a template✓
- Free nucleotides✓ attach to the individual strands
- with complementary nitrogen bases✓ pairing
- Two identical DNA molecules✓ are formed
- Process is controlled by enzymes✓ Any 5 (5)

3.1.2
- If the incorrect nitrogen base✓ attaches to the original strand/if a nitrogen base is added or deleted
- the sequence✓/order of the bases changes on the new DNA molecule
- resulting in a change in the gene structure✓ Any 2 (2)

**(7)**

3.2 3.2.1 'Out of Africa' hypothesis✓ (1)

3.2.2 Mitochondrial DNA✓/mtDNA (1)

3.2.3
- The mitochondrial DNA is only inherited from the mother✓
- Any mutation✓on this DNA
- can be traced✓ along the maternal line only (3)

3.2.4 Fossil evidence✓
Archaeological evidence✓ Any 1 (1)
(***Mark first ONE only)*** **(6)**

3.3
- A population of a species becomes separated✓ by a geographical barrier
- then the population splits into different populations✓
- There is no gene flow✓ between the populations
- Each population may be exposed to different environmental conditions✓
- Natural selection occurs independently✓ in each population
- The individuals of each population become 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✓and are thus different species Any 6 **(6)**

3.4.1 X - Foramen magnum✓ (1)
Y - Canine✓ (1)

3.4.2
- The foramen magnum is located in a more forward position✓below the skull
- showing that organism C is bipedal✓
- This allows for the vertebral column/spine to extend vertically✓from the base of the skull
- to balance the body weight in upright walking✓ Any 3 (3)

3.4.3 (a) B✓ (1)

(b) A✓ (1)

3.4.4
- There is an increase✓
- in the cranium size✓ from organism **B** to organism **C**
- This will allow it to house a larger brain✓/cerebrum which suggests greater intelligence (3)

3.4.5

| Skull B | Skull C |
|---|---|
| Brow ridges pronounced✓ | Brow ridges are not as pronounced✓ |
| More protruding jaws✓/larger jaws | Less protruding jaws✓/ smaller jaws |

(***Mark first TWO only)*** Table1 + (2 x 2) (5)
**(15)**

3.5 3.5.1
- Because they were normal they must each have one dominant allele✓
- and in order for their children to be affected each parent must have one recessive allele✓ (2)

3.5.2 NN✓ or Nn✓ (2)

3.5.3
- The father would have been affected✓ if it was sex-linked
- in order for the daughter to be affected✓ (2)

**(6)**
**[40]**

**TOTAL SECTION B: 80**

## SECTION C

## QUESTION 4

Lamarckism
- The ancestral elephant stretched its proboscis✓
- to get leaves✓ in trees/further from the body
- The more it used the proboscis✓,
- the longer it became✓
- The offspring then inherited the acquired longer proboscis ✓
- Over many generations the length of the proboscis increased✓
- until it became a trunk✓ as in the modern elephant Any 5 (5)

Darwinism
- There was a great deal of genetic variation✓ amongst the offspring
- Some had long proboscis✓
- and some had short proboscis✓
- There was a change in environmental conditions✓/competition amongst the animals for food
- They had to reach higher in the trees to get leaves✓
- The animals with shorter proboscis died✓
- Those individuals with the longer proboscis survived✓
- They then reproduced✓
- and passed on this characteristic to their offspring✓
- The next generation of animals had a greater proportion✓ of animals with longer proboscis Any 9 (9)

Artificial selection
- Humans✓ select the elephants with
- desirable characteristics✓/long trunk
- and mate them to produce offspring with longer trunks✓
- Those that are pure breeding✓ for long trunks
- are further selected to mate to produce offspring with further longer trunks✓ Any 3 (3)

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 | All aspects required by the essay have been sufficiently addressed |
| **In this essay in Q4** | Only information relevant to the explanations in terms of Lamarckism, Darwinism and artificial selection are provided | Explanations in terms of Lamarckism, Darwinism and artificial selection are provided in a logical and sequential manner. | At least **3** correct points for the explanation using Lamarckism, **6** correct points for the explanation using Darwinism and **2** correct points using artificial selection |
| **Mark** | 1 | 1 | 1 |

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