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basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES P1

NOVEMBER 2013

MEMORANDUM

MARKS: 150

This memorandum consists of 12 pages.

PRINCIPLES RELATED TO MARKING LIFE SCIENCES 2013

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 part of it is required**
Read all and credit relevant part.
4. **If comparisons are asked for and descriptions are given**
Accept if 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 is incorrect, do not credit. If sequence and links becomes 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 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 provided it does not mean something else in Life Sciences or if it is out of context.

13. **If common names given in terminology**
Accept provided it was accepted at the national memo discussion meeting.
14. **If only letter is asked for and only name is given (and vice versa)**
No 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 appears 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. No changes must be made to the marking memoranda without consulting the provincial internal moderator who in turn will consult with the national internal moderator (and the external moderators where necessary)
20. Only memoranda bearing the signatures of the national internal moderator and the UMALUSI moderators and distributed by the National Department of Education via the provinces must be used.

SECTION A**QUESTION 1**

- | | | | | |
|-----|--------|-------------------------------------|----------|-------------|
| 1.1 | 1.1.1 | B ✓✓ | | |
| | 1.1.2 | A ✓✓ | | |
| | 1.1.3 | C ✓✓ | | |
| | 1.1.4 | B ✓✓ | | |
| | 1.1.5 | B ✓✓ | | |
| | 1.1.6 | B ✓✓ | | |
| | 1.1.7 | D ✓✓ | | |
| | 1.1.8 | A ✓✓ | | |
| | 1.1.9 | B ✓✓ | | |
| | 1.1.10 | C ✓✓ | (10 x 2) | (20) |
| 1.2 | 1.2.1 | Anticodon ✓ | | |
| | 1.2.2 | Polyploid ✓/polyploidy | | |
| | 1.2.3 | Haemophilia ✓ | | |
| | 1.2.4 | Heterozygotes ✓/heterozygous/hybrid | | |
| | 1.2.5 | Phenotype ✓ | | |
| | 1.2.6 | DNA profiling ✓/DNA fingerprinting | | |
| | 1.2.7 | Autosomes ✓ | | |
| | 1.2.8 | Cloning ✓ | | (8) |
| 1.3 | 1.3.1 | A only ✓✓ | | |
| | 1.3.2 | A only ✓✓ | | |
| | 1.3.3 | A only ✓✓ | | |
| | 1.3.4 | B only ✓✓ | | |
| | 1.3.5 | A only ✓✓ | | |
| | 1.3.6 | Both A and B ✓✓ | | |
| | 1.3.7 | Both A and B ✓✓ | | |
| | 1.3.8 | A only ✓✓ | (8 x 2) | (16) |
| 1.4 | 1.4.1 | (a) Rr ✓ | | (1) |
| | | (b) rr ✓ | | (1) |
| | 1.4.2 | 75 ✓✓ % | | (2) |
| | 1.4.3 | Rr ✓ | | (2) |
| | | rr ✓ (any order) | | (6) |

TOTAL SECTION A: 50

SECTION B**QUESTION 2**

- 2.1 2.1.1 (DNA) replication✓ (1)
- 2.1.2 During interphase✓/ between cell divisions /before cell division/before mitosis/ before meiosis (1)
- 2.1.3 1 - G✓/Guanine
2 - C✓/Cytosine (2)
- 2.1.4 RNA is a single strand✓/while DNA is double stranded
RNA has uracil✓/and DNA has thymine
RNA has single bases✓/and DNA has paired bases
RNA has ribose✓/while DNA has deoxyribose
RNA is much shorter✓/whereas DNA is longer
RNA maybe linear✓/straight/ looped /and DNA is helix
(Mark first TWO only) Any (2)
(6)
- 2.2 2.2.1 Translation✓ (1)
- 2.2.2 (a) mRNA✓ (1)
(b) tRNA✓ (1)
(c) Codon✓ (1)
- 2.2.3 Histidine✓ glycine✓ methionine✓ (correct sequence) (3)
(7)
- 2.3 2.3.1 A - Homologous ✓ chromosomes/bivalent/(tetrad) (1)
B - Centromere✓ (1)
- 2.3.2 Y – Z – X ✓ (Must be in the correct sequence) (1)
- 2.3.3 Genetic material was exchanged✓ between the chromosomes in diagram X
due to crossing over ✓
whereas the chromosomes in diagram Y did not undergo crossing over✓ (3)
- 2.3.4 (a) During meiosis the chromosome pair 21 does not separate✓/
there is non-disjunction
Two gametes (M and N) will have an extra copy of chromosome✓ number 21 and therefore the other gametes (O and P) do not have a copy of chromosome 21 (2)
- (b) Down syndrome✓/ Trisomy 21
If this gamete fuses with a normal sperm having 1 copy of chromosome 21✓
the resulting zygote will have 3 copies ✓ of chromosome number 21 /47 chromosomes (3)
(11)

2.4

P_2 /(parent) phenotype Grey bodied x Grey bodied✓
genotype Gg x Gg✓

✓ *Meiosis*

✓ G /gametes G, g x G, g✓

Fertilisation

F_2 /(offspring/ F_1) genotype $\{GG, Gg, Gg\}$ & $\{gg\}$ ✓
phenotype grey bodied black bodied✓

Any (6)

OR

P_2 /(parent) phenotype Grey bodied x Grey bodied✓
genotype Gg x Gg✓

✓ *Meiosis*

✓ *Fertilisation*

gametes	G	g
G	GG	Gg
g	Gg	gg

1 mark for correct gametes✓
1 mark for correct genotypes✓

F_2 /(offspring) genotype $\{GG, Gg, Gg\}$ & $\{gg\}$
phenotype grey bodied black bodied✓

Any (6)
[30]

QUESTION 3

- 3.1 3.1.1 An organism's complete set of genes✓ (1)
- 3.1.2 Genetic engineering: involves the transfer of genes✓ from one organism to another/(manipulation of DNA)
- Selective breeding: Parents with desirable phenotypes are selected to produce offspring with desirable phenotypes✓
- OR**
- Genetic engineering can involve gene transfer between organisms from different kingdoms✓
- Selective breeding can occur using organisms from the same or different species within a kingdom✓ (2)
- 3.1.3
- To assess the risks to human health ✓/the environment
 - To determine if the presence of the transferred gene will affect the expression of other genes✓
 - To test the effectiveness✓ of the product
- (Mark first ONE only)** Any (1)
- 3.1.4
- The spraying of herbicide will kill the weeds✓
 - without killing the crops✓,
 - thus reducing the competition✓ and increasing the yield✓
- Any (3)
- 3.1.5
- Produce crops that are resistant to adverse conditions✓/drought/disease/pests
 - Increase crop yield✓
 - Change the time for the ripening of fruits✓
 - Increase shelf life of plant products✓
 - Improve nutritional value of food✓
 - Improve the taste✓ of food
 - Developing fruit/plants with desirable characteristics✓
- (Mark first THREE only)** Any (3)
- 3.1.6 The companies have invested✓ a lot of time✓/money to make the GM seeds
- The companies want to control the seed market✓ thus increasing their profit✓ Any 1 x 2 (2)
- (12)**

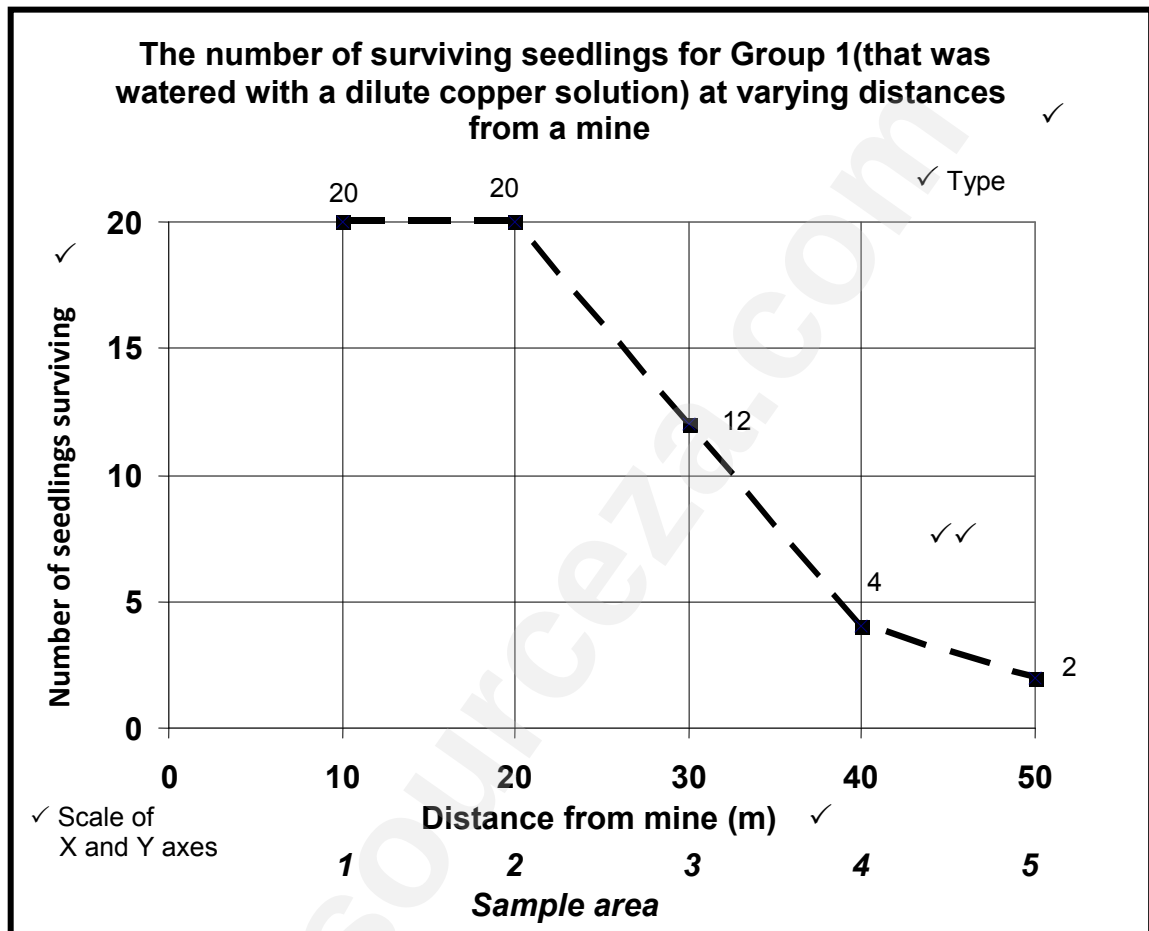
- 3.2 3.2.1 3:1✓ (1)
- 3.2.2 X: Seed shape = $\frac{5474}{1850} = 2,96 : 1✓/2.95:1$
- Y: Seed colour = $\frac{6022}{2001} = 3,01 : 1✓$
- Closest: Seed colour✓/(Y) (3)
- 3.2.3 Y has the larger✓sample✓ size (2)
- 3.2.4 Round✓ seeds (1)
- 3.2.5 All the plants must be homozygous in P₁✓
All the plants must be heterozygous in P₂✓
Same type of plant✓/species
Same environmental conditions✓
Same method of pollination✓
(Mark first TWO only) Any (2)
- 3.2.6 During gamete formation, members of each allele pair separate✓
such that each gamete only contains one allele✓ for a particular trait (2)
(11)
- 3.3
- There is variation in the original population of organisms✓
 - The population has been separated into two groups✓
 - due to a **geographical barrier***✓/any example
 - No gene flow✓ occurs between the two groups
 - The environmental conditions on either side of the geographical barrier may be different✓
 - Each population undergoes natural selection independently✓ and develops differently✓
 - Genotypically✓ and phenotypically✓
 - The differences that develop between the two populations prevent them from inter-breeding✓ even if they were to mix
 - One or both groups may become new species✓
- Max 6 + 1*(compulsory mark) (7)
[30]

TOTAL SECTION B: 60

SECTION C

QUESTION 4

4.1 4.1.1



Checklist for the mark allocation of the graph

Correct type of graph with points joined	1
Title of graph	1
Correct label for X-axis	1
Correct label for Y-axis	1
Appropriate scale for X-axis and Y-axis	1
Plotting of points	1–1 to 4 points plotted correctly 2–all 5 points plotted correctly

NOTE:

If the wrong type of graph is drawn:

- Marks will be lost for 'correct type of graph'

If axes are transposed:

- Marks will be lost for labelling of X-axis and Y-axis

(7)

- 4.1.2 Number of surviving seedlings✓
Average height of surviving seedlings✓ (2)
- 4.1.3 Distance✓ from mine/sample area
Solution added ✓/(dilute copper solution and distilled water)
(Mark first TWO only) (2)
- 4.1.4 - In the beginning, there was variation✓in the grass species population
- there were copper tolerant and copper intolerant forms✓
- Due to the high copper concentration near the mine✓
- the copper intolerant plants died ✓
- whereas the copper tolerant plants survived✓
- and were able to reproduce✓
- thus passing copper tolerance to the offspring✓
- Over many generations, the proportion of copper tolerant plants increased✓and hence most seedlings from seeds collected near the mine survived Any (6)
(17)
- 4.2 Analysis of mutations✓ on the Y-chromosome shows that the oldest male ancestors ✓of humans were from Africa✓ (3)

4.3 Foramen magnum

- The foramen magnum was in a backward position in the ape-like beings✓^F
- but in a forward/ central/ ventral position in modern humans✓^F

Significance

- This represents a change from quadrupedalism in ape-like beings✓^S
- To bipedalism/(walking upright) in modern humans✓^S, leading to the following in modern humans:
 - o Increased awareness of the environment✓^S in sensing danger/food
 - o Freeing of the hands to use implements✓^S/ carry objects/ weapons/ offspring
 - o Exposure of a large surface area for thermoregulation✓^S/losing body heat to surroundings in hot conditions/reducing overheating
 - o Display of sex organs /breasts as part of courtship behaviour✓^S

Cranium

- Modern humans have a larger cranium✓^F *than the ape-like beings*✓^F
- Modern humans have a less sloping forehead✓^F *than the ape-like beings*✓^F
- Modern humans have a cranium that is more rounded✓^F *than the ape-like beings*✓^F

Significance

- This allowed space for a larger brain✓^S in humans *than in ape-like beings*✓^S, making the following possible:
 - o Better co-ordination of movement✓^S
 - o Processing of a large amount of information✓^S
 - o Processing information faster✓^S
 - o Development of spoken and written languages to communicate✓^S

Jaws

- Humans have smaller jaws✓^F *than the ape-like beings*✓^F
- Humans have jaws that are non-prognathous✓^F/ flat face compared to the jaws of ape-like beings which are prognathous✓^F/sloping face
- Humans have C-shaped jaws✓^F /jaws that are gently curved compared to the U shaped jaws✓^F in the ape-like beings

Significance

- This corresponds with a change in diet from hard, raw food✓^S in the ape-like beings
- To softer, cooked food✓^S in humans

Dentition/Teeth

- In ape-like beings there are gaps✓^F/diastema between incisors and canines
- but no gaps✓^F between the teeth in humans
- Humans have smaller teeth✓^F/incisors and canines *than the ape-like beings*✓^F
- Humans have flatter molars and pre-molars✓^F *than the ape-like beings*✓^F

Significance

- This corresponds with the decreased need to bite and tear✓^S
- and an increased need to grind and chew✓^S in humans in view of the change in diet to soft, cooked food✓^S

Eyebrow ridges

- Humans have eyebrow ridges that are smaller^{✓F} *than those of the ape-like beings*^{✓F}

Significance

- There is a decreased need to strengthen the skull^{✓S} of humans
- due to the smaller size of the jaws^{✓S}

Chin

- In humans the chin is more developed^{✓F} compared to the *ape-like beings*^{✓F}

Significance

- Developed chin assists with speech^{✓S} in humans

Zygomatic arch

- In humans the zygomatic arch/cheek bone is less developed^{✓F} *than in the ape-like beings*^{✓F}

Significance

- This corresponds with the decreased need for attachment of strong muscles^{✓S}
- due to the decreased jaw size^{✓S} in humans

Description of features that changed any (10)

Significance of the changes (must be linked to the features described) any (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 topic	Ideas are arranged in a logical/cause-effect sequence	All aspects required by the essay have been sufficiently addressed
In this essay	Only information relevant to the <i>structural changes</i> or <i>significance</i> is given (there is no irrelevant information)	Generally each significance is appropriately linked to the relevant structural change to the skull	At least 3 structural changes described together with the significance of each
Mark	1	1	1

R✓

L✓

C✓

TOTAL SECTION C: 40
GRAND TOTAL: 150