MARKING GUIDELINES

EXAMINATION	NATIONAL SENIOR CERTIFICATE
GRADE	12
DATE	MAY/JUNE 2024
SUBJECT	LIFE SCIENCES
PAPER	2
MARK TOTAL	150
DURATION (HOURS)	2½
NUMBER OF PAGES	13

SOUTH AFRICAN COMPREHENSIVE ASSESSMENT INSTITUTE

SUID-AFRIKAANSE KOMPREHENSIEWE ASSESSERINGSINSTITUUT

PRINCIPLES RELATED TO MARKING LIFE SCIENCES 2024

1. **If more information than marks allocated is given**
   Stop marking when maximum marks are 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 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 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 marking guideline 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. Marking guideline 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, drawings, 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 SACAI CHIEF MARKER and SACAI MODERATOR and where applicable, also the UMALUSI MODERATOR.

SECTION A

QUESTION 1

1.1.1 B√√
1.1.2 A√√
1.1.3 C√√
1.1.4 B√√
1.1.5 D√√
1.1.6 C√√
1.1.7 C√√
1.1.8 B√√
1.1.9 A√√ **(9x2) [18]**

1.2.1 Down syndrome√/Trisomy 21
1.2.2 Genome√
1.2.3 Continuous√
1.2.4 Gradualism√
1.2.5 Phenotype√
1.2.6 Chiasma√ **[6]**

1.3.1 None√√
1.3.2 Both√√
1.3.3 B (only)√√
1.3.4 A (only)√√
1.3.5 Both√√ **(5x2) [10]**

1.4.1 DNA replication√ (1)
1.4.2 Interphase√ (1)
1.4.3 a) Deoxyribose√ (1)
b) Phosphate√ group (1)
1.4.4 Weak hydrogen bond√ (1)
1.4.5 Nucleotide√ (1)
1.4.6 Adenine√ (1)
1.4.7
- Carry hereditary information√/ carry genetic information from generation to generation
- Controls protein synthesis√ (2)

1.4.8 Length of DNA= $(6\ 000 \times 10^{6})$√ x $(0{,}34 \times 10^{-9}\ m)$√

= $2\ 040 \times 10^{-3}$ m

= 2,04 m √ (3)

[12]

1.5 a) C√ (1)

b) B√ (1)

c) E√ (1)

d) A√ (1)

[4]

TOTAL SECTION A: [50]

SECTION B

QUESTION 2

2.1.1 3 → 1 → 5 → 2 → 4
All phases in sequence – 3 marks
THREE phases in correct sequence – 2 marks
TWO phases in correct sequence – 1 mark
NO MARK if less than TWO phases are correct (3)

2.1.2 a) Spindle√/ spindle fibre (1)
b) Centriole√ (1)
c) Homologous chromosomes√/ bivalent (1)
d) Chromatid (1)

2.1.3 Prophase I√ (1)

2.1.4 Homologous chromosomes√ form bivalents√/cross over (2)

2.1.5
- Homologous chromosomes√/pairs
- arrange randomly√
- at equator√/both sides of equator/at middle of cell
- to produce gametes with different combination of maternal and paternal alleles√. (4)

2.1.6 4√ (1)

2.1.7 Phase 2√ Anaphase II√
OR
Phase 5√ Anaphase I√
(Any 1 x 2) (2)

[17]

2.2.1 Nucleus√ (1)

2.2.2 a) Translation√ (1)
b) Messenger RNA√ / mRNA (1)
c) Transfer RNA√ / tRNA (1)

2.2.3 Section of DNA√ that codes for a certain characteristic√/ protein. (2)

2.2.4 94√ (1)

2.2.5 Anti-codon √ (1)
[8]

2.3.1
- The gene for Duchenne occurs on the X-chromosome√.
- Males have only one X-chromosome, if they inherit the recessive gene they will have the disease√.
- Females have two X-chromosomes, if they inherit the recessive gene there is another X-chromosome that carries the normal gene√. (3)

2.3.2
- A son inherits his Y-chromosome from his father√ / no gene for dystrophin on the Y-chromosome
- Inherits X-chromosome from his unaffected mother√ (2)

2.3.3 Normal dystrophin production: D
Duchenne muscular dystrophy: d

P_1/parent: Phenotype: unaffected male x carrier female√
Genotype: X^DY x X^DX^d √
Meiosis √
Gametes: X^D ; Y ; X^D ; X^d √

F_1/offspring: Genotype X^DX^D ; X^DX^d ; X^DY ; X^dY
Correct genotype √
Phenotype: 25% carrier females
25% unaffected females
25% unaffected males
25% males with Duchenne √*
***compulsory mark + any 5** (6)

OR

P_1/parent: **Phenotype -** unaffected male **x** carrier female √
Genotype - **X^DY** **x** **X^DX^h** √
Meiosis √
Gametes: **X^D ; Y; X^D ; X^d**
Fertilisation

Gametes	X^d	Y
X^D	X^DX^D	X^DY
X^d	X^DX^d	X^dY

1 mark for correct gametes
1 mark for correct genotypes

F_1/offspring: Phenotype - 25% carrier females
25% unaffected females
25% unaffected males
25% affected males √*
***Compulsory mark + any 5** (6)

2.3.4
- If the foetus has the disease, the parents will be prepared√
- for the symptoms of the disease√/ they will know how to deal with a child with this disease/ use medication to prolong the life expectancy.

OR

- If the foetus has the gene for DMD the parents can decide to have an abortion√
- Due to the short life expectancy√/ the way the symptoms will affect the quality of the child's life.

(Any 1 x 2) (2)

[13]

2.4.1 Arrowhead√ (1)

2.4.2
- Large brain√ (1)
- Opposable thumb√ (1)

2.4.3 Cultural evidence√ (1)

2.4.4 a)
- It was used to cut animals skins to produce clothing√
- To help with survive cold weather√/ environmental exposure.

OR

- It was used to scrape meat from bones√/cut parts of meat in smaller portions
- To make the meat easier to digest√/ to cook.

(Any 1 x 2) (2)

b)
- It was used to strike a stone to produce sharp flakes from the core√
- These sharp flakes were then used to cut animal hides and butcher meat√.

OR

- It was used to crack open nuts√
- Supply energy rich food source for human survival√.

OR

- It was used to crack open bones to access bone marrow√
- Supply energy rich food source for human survival√.

(Any 1 x 2) (2)

2.4.5
- Mitochondrial DNA is passed down unchanged from mother to child√/ no recombination of maternal and paternal mtDNA
- This enables the study of inheritance down maternal lines√.
- Mitochondrial DNA have a high rate of mutations√
- That can be used as genetic markers to prove relationship between individuals√. (4)

[12]

TOTAL QUESTION 2: [50]

QUESTION 3

3.1.1 Change√ in the sequence of DNA√. (2)

3.1.2 The mutated gene is on chromosome number 4√. (1)

3.1.3 Percentage= $\frac{1}{200} \times 100\surd = 0{,}5\% \surd$ (2)

3.1.4 a)

- Close relatives/individuals that are genetically closely related have offspring together. √
- The Amish community do not usually marry people from outside their group√ and will therefore have children with people from the same community. (2)

b)

- Increased chance that both parents are carriers of the recessive allele√
- Child will then have both recessive alleles√/ homozygous recessive for the Ellis-van Creveld syndrome. (2)

[9]

3.2.1 Heading: Amount of Bt crops grown and the number of cases of resistance to Bt crops from 1996 to 2016.

Time (years)	Amount of Bt crops grown (million ha)	Total number of cases of resistance to Bt crops
1996	0	0
2000	11	1
2004	24	2
2008	49	7
2012	72	13
2016	95	17

Mark allocation:

Heading (H)	All variables mentioned	1 mark
Column headings (C)	Time in years Amount of Bt crops planted (million ha); Total cases of practical resistance to Bt crops	1 mark 1 mark
Table (T)	All border lines of table drawn	1 mark
Information in rows (D)	4 – 6 rows correct 1 – 3 rows correct	2 marks 1 mark

(6)

3.2.2
- From 1996 to 2016 there was a constant increase in the growth of Bt crops√
- and a constant increase in the cases of Bt resistance in insects√. (2)

3.2.3
- Theory of natural selection√.
- Variation amongst the insects due to a mutation for resistance against Bt toxins√/ some insects were resistant against Bt toxins and others not.
- When the insects feed on the Bt crops, those with the mutation for resistance survived√
- they reproduced√
- and passed the gene for resistance on to the next generation√.
- Those without the mutation for resistances died from the Bt toxins and did not reproduce√.
- After many generations the gene for resistance became more prominent in the population√/ more insects in the population showed resistance to the Bt toxins. **(Any correct 6 answers)** (6)

3.2.4
- Farmers use less pesticides to kill pests√
- Less insects killed that are favourable to the environment, e.g., bees √.

OR

- Less insects are killed by pesticides√
- This decreases the effect of bioaccumulation of pesticides in an ecosystem√. **(Any 1 x 2)** (2)

[16]

3.3.1 B√ (1)

3.3.2
- Pelvis is long and narrow√
- Knees are not directly under the middle line of the body√/ femur is not angled to the inside. (2)

3.3.3
- Allowed humans to walk long distances and to migrate to new habitats√.
- Better vision of prey√/ predators
- Arms were free to gather food during walking√/ carry offspring / carry weapons.
- Reduce risk of over-heating√.

(Any correct THREE answers) (Mark FIRST THREE answers only) (3)

3.3.4 C√ (1)

3.3.5 a) Diastema√ (1)

b)
- The canine in the lower jaw is longer than the other teeth√
- The opening accommodates for this canine√/ allows space for the lower canine to fit in. (2)

3.3.6 E√ (1)

3.3.7
- Parabolic curve√/ sides of jaw are more rounded/ not U-shaped
- No diastema√/ no enlarged canines
- Teeth are smaller√

(Any TWO answers) (Mark FIRST TWO answers only) (2)

[13]

3.4.1 Selective breeding√ (1)

3.4.2
- Cain used indigenous knowledge of cross breeding plants with favourable features√
- Genetic engineering use biotechnological processes to directly manipulate an organism gene√. (2)

3.4.3
- Desirable results are achieved faster√
- Process is controlled√/ outcome is more predictable. (2)

3.4.4 No.
- Money and time invested to develop this fruit√
- could rather be invested to develop plants that give higher yield or fruit with higher nutritional value√.

OR
- The cost of these fruit is much higher than normal fruit.√
- Consumers do not get more nutrients for the extra money paid.√

Yes
- This fruit will motivate people to eat fruit√
- and get the nutritional value thereof√ / prevent waste of fruit.

(Any 1 x 2) (Mark FIRST answer only) (2)

[7]

3.5.1 Biogeography√ (1)

3.5.2
- The fossils of *Glossopteris* were discovered on continents that were part of the continent Gondwanaland√.
- *Glossopteris* developed on Gondwanaland before it separated√
- Due to Continental drift√. (3)

3.5.3
- Marsupials√/ examples like kangaroo/ koala/ Tasmanian devil/ wombat.
- Flightless birds√ / examples like ostrich/ kiwi√/ rhea/ emu/ cassowary
- Old World monkeys and New World monkeys√
- Baobab trees√

(Any 1) (Mark FIRST answer only) (1)

[5]

TOTAL QUESTION 3: [50]

TOTAL SECTION B: [100]

GRAND TOTAL: [150]