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DEPARTMENT OF
EDUCATION

NATIONAL
SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES P2
SEPTEMBER 2022
MARKING GUIDELINES

MARKS: 150

This memorandum consists of 11 pages

PRINCIPLES RELATED TO MARKING LIFE SCIENCES 2022

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 are incorrect, do not credit. If sequence and links becomes correct again, resume credit.
9. **Non-recognized 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 recognizable, 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.

MARKING GUIDELINE

15. **If units are not given in measurements**
Memorandum will allocate marks for units separately, except where it is already given in the question.
16. Be sensitive to the **sense of an answer, which may be stated in a different way.**
17. **Caption**
Credit will be given for captions to all illustrations (diagrams, graphs, tables, etc.) except where it is already given in the question.
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.

SECTION A
QUESTION 1

1.1	1.1.1	D✓✓		
	1.1.2	B✓✓		
	1.1.3	B✓✓		
	1.1.4	C✓✓		
	1.1.5	A✓✓		
	1.1.6	C✓✓		
	1.1.7	B✓✓		
	1.1.8	C✓✓		
	1.1.9	D✓✓		
	1.1.10	B✓✓	(10 x 2)	(20)
1.2	1.2.1	Independent✓ variable		
	1.2.2	(Law of) segregation✓		
	1.2.3	Heterozygous✓		
	1.2.4	Extinction✓		
	1.2.5	Cytokinesis✓		
	1.2.6	Foramen magnum✓		
	1.2.7	Centromere✓		(7)
1.3	1.3.1	A only✓✓		
	1.3.2	A only✓		
	1.3.3	Both A and B✓✓	(3 x 2)	(6)
1.4	1.4.1	(a) Crossing over✓ (b) Prophase✓		(1) (1)
	1.4.2	Y - Chiasma✓		(1)
	1.4.3	- Homologous chromosomes✓/bivalents pair up - Each chromosome has 2 chromatids✓ - Chromatids overlap/cross over✓ - Genetic material is exchanged✓ between non-sister chromatids✓ - After the process of crossing-over chromosomes have genes from the homologous partner✓		
			Max	(3) (6)

MARKING GUIDELINE

- 1.5 1.5.1 This is a Dihybrid cross:
It is a cross between two individuals
with **two observed traits** ✓ / coat colour and horn length
that are controlled by **two distinct genes**. ✓ (2)
- 1.5.2 BbHh ✓ (1)
- 1.5.3 (a) BBHh ✓✓ (2)
(b) BBhh = black coat colour; ✓ short horns ✓ (2)
- 1.5.4 BBHh = 4 }
BbHh = 4 } 8 x Black coat; Long horns }
Bbhh = 4 } } ✓
BBhh = 4 } 8 x Black coat; Short horns }

 $\frac{8}{16} \times 100$ } ✓ = 50 ✓% (3)
- 1.5.5 (Principle of) Independent Assortment (1)
(11)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1

2.1.1 (a) Cell membrane ✓
(b) Spindle fibres ✓ (2)

2.1.2 The chromosomes are of the:
- Same size ✓
- Same shape ✓
- Same length ✓
Any (2)
(Mark first TWO only)

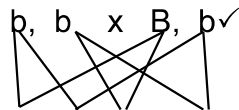
2.1.3 1 - Metaphase 1 ✓
2 - Prophase 1 ✓
3 - Metaphase 2 ✓ (3)

2.1.4 - Crossing over ✓ (2)
- Random arrangement of chromosomes ✓ (9)
(Mark first TWO only)

2.2 P₁/parent phenotype blue eyes x brown eyes ✓
genotype bb x Bb ✓

Meiosis

G/gametes



Fertilisation

F₁/offspring genotype Bb, bb, Bb & bb ✓

phenotypes 2 blue eyes and 2 brown eyes ✓

genotypes Bb, bb, Bb, bb ✓

Parents and offspring ✓ / P₁ and F₁

Meiosis and fertilisation ✓ **Any** (6)

OR

P₁/parent phenotype blue eyes x brown eyes ✓
genotype bb x Bb ✓

Meiosis

Fertilisation

gametes	B	b
b	Bb	bb
b	Bb	bb

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

F₁/offspring: phenotype 2 blue eyes and 2 brown eyes ✓

Parents and offspring ✓ / P₁ and F₁

Meiosis and fertilisation ✓ **Any** (6)

2.3

2.3.1

- Individual 5 is an affected male ✓ and
 - He must have one Y chromosome ✓ and
 - the recessive allele on the X chromosome ✓
 - which he would have inherited from his mother (individual 2) ✓
 - But she does not have the disorder ✓, which means it is caused by a recessive allele
- (5)

2.3.2 (a) 3: X^nX^n ✓(b) 4: X^NY ✓ (2)2.3.3 0% ✓ (1)
(8)

2.4

2.4.1 Planning:

- Get permission from all stakeholders/ the learners and their parents ✓
 - Decide on the sample size/ composition/ participants ✓
 - Decide on the method to use to determine the blood groups/ ensure that the learners know their blood groups ✓
 - Determine the apparatus and equipment needed to test for the different blood groups ✓
 - Design a record sheet ✓
 - Set a date/ time for the investigation ✓
 - Arrange venue ✓
- (Mark first TWO only)

Any (2)

2.4.2 B ✓ (1)

2.4.3 Represent separate/discrete/different ✓
entities/blood groups /units ✓**OR**

Discontinuous ✓ variable ✓ / No ✓ intermediate groups ✓ (2)

2.4.4 45 % ✓ /Majority of the sample group have blood group A ✓

OR

10 % ✓ /Minority of the sample group have blood group B ✓

OR

20 % ✓ of the sample group have blood group AB ✓

OR

35 % ✓ of the sample group have blood group O ✓ (2)

2.4.5 The sample group was very small ✓ / only one group of learners
from an entire school
and is therefore not representative of the world population ✓ (2)**(9)**

MARKING GUIDELINE

2.5

2.5.1 2 mya✓ (1)

2.5.2 $1450 \text{ cm}^3 - 430 \text{ cm}^3 / (1450 - 430) \text{ cm}^3$
 $= 1020 \text{ cm}^3$ (2)

2.5.3 Have better co-ordination of movement✓
 Process large amount of information✓
 Processing information faster✓
 Development of spoken and written languages to communicate✓
 (Mark first TWO only) (2)

2.5.4 Table✓ (1)

<i>Homo sapiens</i>	<i>African ape/Gorilla</i>
Large cranium✓	Small cranium✓
Smaller jaw✓	Bigger jaw✓
Non-prognathous✓	Prognathous✓
Smaller teeth/canines✓	Bigger teeth/canines✓
Brow ridge reduced✓/ absent	Brow ridge large✓/ pronounced
Well-developed chin✓	Less developed chin✓

(Mark first THREE only) (6)
(7)

2.5.5

- The foramen magnum✓ moved from a backwards position to a more forward position in the modern human✓
 - The curvature of the spine✓ changed from C-shaped to S-shaped✓
 - The pelvis✓ changed from long and narrow to wider and shorter. ✓
- (Mark first TWO only) (4)
(16)

2.6 2.6.1 (a) new equipment✓ is expensive
 labour intensive✓
 many clinical trials✓ must be done/long time to produce a safe product
(Mark first ONE only) Any (1)

(b) may easily pollinate non-GM crops✓/may mate with non-GM animals✓
 they might out-compete the naturally occurring organisms✓
(Mark first ONE only) Any (1)
(2)

TOTAL QUESTION 2: [50]

MARKING GUIDELINE

QUESTION 3

3.1

- 3.1.1
- there is variation ✓ in the wolves
 - in terms of their behaviour ✓ / reduced aggression
 - and genetics ✓ / ability to produce amylase/ digest starch
 - A population of less aggressive/more tame wolves ✓ were separated ✓ from the original wild population
 - They became scavengers ✓ around human settlements because they could digest the starch in human food ✓
 - and were more suited for survival ✓ amongst a human population
 - The genes for producing more amylase were passed on to their offspring ✓
 - The next generation had a higher proportion of individuals with the favourable characteristic ✓

Max 6 (6)

- 3.1.2 (a) They can interbreed ✓ with different domestic dog breeds ✓ to produce fertile ✓ offspring (3)

- (b) Humans chose desired characteristics ✓ and bred dogs ✓ with those phenotypes and genotypes to create dogs that suit their needs ✓ / e.g. hunters, companions, helpers. (3)
- (12)**

3.2

- 3.2.1
- Due to a mutation ✓
 - some bacteria are resistant to the antibiotic ✓ and
 - others are not ✓
 - There is a large degree of variation in the bacteria population ✓
 - When the antibiotic was first used,
 - the non-resistant bacteria died ✓
 - The resistant bacteria survived ✓
 - to reproduce ✓ thereby
 - increasing the population of antibiotic-resistant bacteria ✓

Any
Max 6 (6)

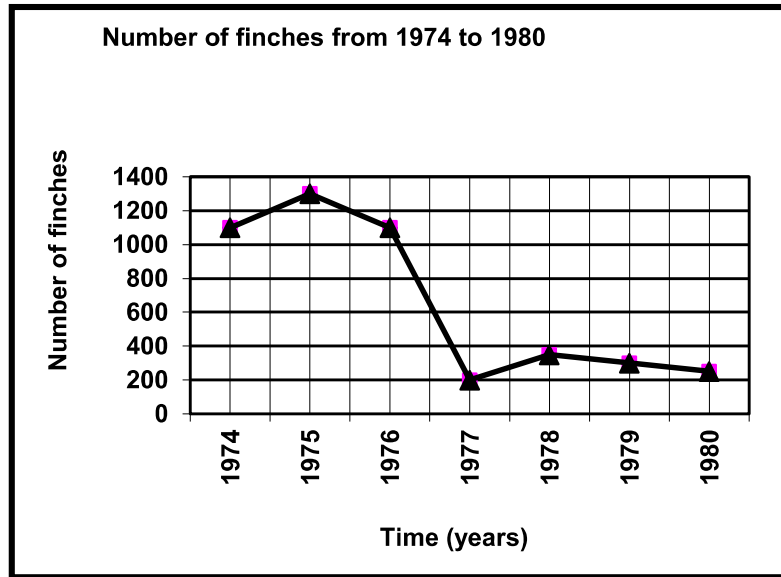
MARKING GUIDELINE

- 3.2.2 - Overuse/ frequent use of antibiotics ✓
- may lead to the development of antibiotic resistant strains of bacteria ✓/Infections caused by these bacteria are no longer affected by the antibiotic treatment
- Antibiotic resistance leads to higher medical costs, prolonged hospital stays, and increased mortality. ✓

(3)
(9)

3.3

3.3.1



Rubric for awarding marks for the graph

Correct type of graph	1
Title of graph	1
Correct label for X and Y-axes	1
Correct scale and units for X and Y-axes	1
Plotting points	1: 1 - 4 correctly plotted 2: All 7 correctly plotted

NOTE:

If the wrong type of graph is drawn: marks will be forfeited for "correct type of graph" as well as for the "joining of points".

(6)

3.3.2 1977 ✓

(1)

3.3.3 A drop in rainfall ✓/ drought causes a drop in seed production ✓/ plant growth causing less food ✓ to support fewer finches ✓

(4)

3.3.4 the beaks of these finches were too small ✓/ not strong enough to be able to eat the large seeds

(1)

(12)

3.4

- 3.4.1 (a) Molecule Y: mRNA✓
(b) Organelle V: ribosome✓
(c) Structure Z: nuclear membrane✓ (3)
- 3.4.2 First codon on molecule Y: AGU✓ (1)
- 3.4.3 R; S; P; Q (must be in correct order) ✓✓ (2)
- 3.4.4 Cytoplasm ✓ (1)
- 3.4.5 If nitrogenous base A is replaced by G, the codon will change to AGC ✓
This will code for another anticodon✓/ UCA instead of AGU
And may result in coding for another amino acid✓
which may change the protein that is formed✓ (4)
- 3.4.6 The double helix DNA unwinds✓
The double-stranded DNA unzips✓/ weak hydrogen bonds break
to form two separate strands✓
One strand is used as a template✓
to form mRNA✓
using free RNA nucleotides from the nucleoplasm. ✓
The mRNA is complementary to the DNA. ✓
mRNA now has the coded message for protein synthesis ✓ (Any 6) (6)

(17)**TOTAL QUESTION 3: 50****GRAND TOTAL: 150**