GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PREPARATORY EXAMINATION

2023

MARKING GUIDELINES

LIFE SCIENCES (PAPER 2) (10832)

14 pages

Please note, the paper is out of 148 not 150. Change the raw mark total on SASAMS from 150 to 148.

PRINCIPLES RELATED TO MARKING LIFE SCIENCES

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 the whole process is given when only part of it is required**
   Read all and credit relevant parts.

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 the 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 the sequence and links become correct again, resume credit.

9. **Non-recognised abbreviations**
   Accept if first defined in the answer. If not defined, do not credit the unrecognised abbreviation but credit the rest of the answer if correct.

10. **Wrong numbering**
    If the answer fits into the correct sequence of questions but the wrong number is given, it is acceptable.

11. **If the language used changes the intended meaning**
    Do not accept.

12. **Spelling errors**
    If recognisable, accept it 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 memo discussion meeting.

14. **If only the letter is asked for and only a 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 differently**.

17. **Caption**
All illustrations (diagrams, graphs, tables, etc.) must have a caption.

18. **Code-switching of official languages (terms and concepts)**
A 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. This applies to all official languages. A marker that is proficient in the relevant official language should be consulted.

19. **Changes to marking guidelines**
No changes must be made to the marking guidelines without consulting the Provincial Internal Moderator.

SECTION A

QUESTION 1

1.1	1.1.1	C ✓✓		
	1.1.2	C ✓✓		
	1.1.3	C ✓✓		
	1.1.4	D ✓✓		
	1.1.5	A ✓✓		
	1.1.6	D ✓✓		
	1.1.7	B ✓✓		
	1.1.8	B ✓✓		
	1.1.9	D ✓✓		
	1.1.10	B ✓✓	(10 x 2)	**(20)**
1.2	1.2.1	Haploid ✓		
	1.2.2	Stem cells ✓/Meristematic		
	1.2.3	Prognathism ✓/prognathous		
	1.2.4	Genetically modified ✓ organism		
	1.2.5	Incomplete dominance ✓		
	1.2.6	Chimpanzee ✓		
	1.2.7	Colour-blindness ✓		
	1.2.8	Genome ✓	(8 x 1)	**(8)**
1.3	1.3.1	Only A ✓✓		(2)
	1.3.2	Only B ✓✓		(2)
	1.3.3	Only B ✓✓		(2) **(6)**

1.4	1.4.1	(a)	D ✓ foramen magnum ✓	(2)
		(b)	C ✓ pelvis ✓/pelvic girdle	(2)
	1.4.2	(a)	C – shaped ✓	(1)
		(b)	S – shaped ✓	(1)
	1.4.3	(a)	Quadrupedal ✓/quadrupedalism	(1)
		(b)	Bipedal✓/bipedalism	(1)
				(8)
1.5	1.5.1		Dihybrid ✓cross	(1)
	1.5.2	(a)	aall ✓✓/llaa	(2)
		(b)	AL, Al, aL, al ✓✓/LA, lA, La, la	(2)
	1.5.3		Complete dominance ✓	(1)
	1.5.4		25 ✓✓%	(2)
				(8)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 2.1.1 (a) adenine ✓/A (1)
(b) deoxyribose ✓sugar (1)
(c) phosphate ✓ (1)

2.1.2 Strand X ✓/X (1)

2.1.3 Uracil is present ✓
(Mark first ONE only) (1)

2.1.4
- 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 (5)

2.1.5 DNA is too large to leave the nucleus ✓/fit through the nuclear pore, but the single stranded mRNA is small enough to leave the nucleus/fit through the nuclear pore
to carry the coded message for protein synthesis from the DNA. ✓

OR

Transcription is important because it is the main point at which the cell regulates ✓
which proteins are to be produced and at what rate. ✓

OR

Transcription makes the mRNA which will contain the code from the DNA ✓
which the cell/ribosome will then read to produce new protein molecules✓ /for the process of translation.
(Mark first ONE only) (2)
(12)

2.2 2.2.1 - A child inherits the DNA ✓
- from both their father and their mother. ✓ (2)

OR

- All the DNA bands/black bands/bars of the child ✓
- will match the mother and the father. ✓

OR

- A child's DNA profile/black bands/bars must be compared ✓
- with both parents. ✓

OR

There is no other scientific test ✓✓ to determine paternity.

2.2.2 (a) Woman Y's child✓/Child Y (1)

(b)
- Five of the DNA bands/black bands/bars of child Y ✓match the black bands/bars of woman Y. ✓
- All / four of the remaining the DNA bands/ black bands/bars of child Y match Mr Megabucks. ✓/the remaining bands of Child Y match Mr Megabucks.

OR

DNA bands/black bands/bars of the child Y ✓ match both the DNA bands/black bands/bars of Woman Y ✓ and Mr Megabucks. ✓ (3)

2.2.3 Skin ✓/blood/saliva/cheek cells/hair follicles (with roots) /semen/ nails
(If hair is given as an example, it MUST include the term **FOLLICLE** to get a mark. (1)
(7)

2.3 2.3.1 Metaphase II ✓/2 (1)

2.3.2 (a) 4 ✓/four (1)
(b) 2 ✓/two (1)

2.3.3 (a) chromosome ✓ (1)
(b) pulls chromatids/chromosomes to opposite poles ✓ (1)

2.3.4
- During prophase I ✓
- homologous chromosomes lie next to each other ✓
- chromatids from each homologous chromosome/non-sister chromatids overlap ✓and touch each other
- at a point called the chiasma ✓(plural: chiasmata)
- Chromatid exchange genetic material ✓

Any (4)

2.3.5 **Diagram showing a cell in anaphase II**

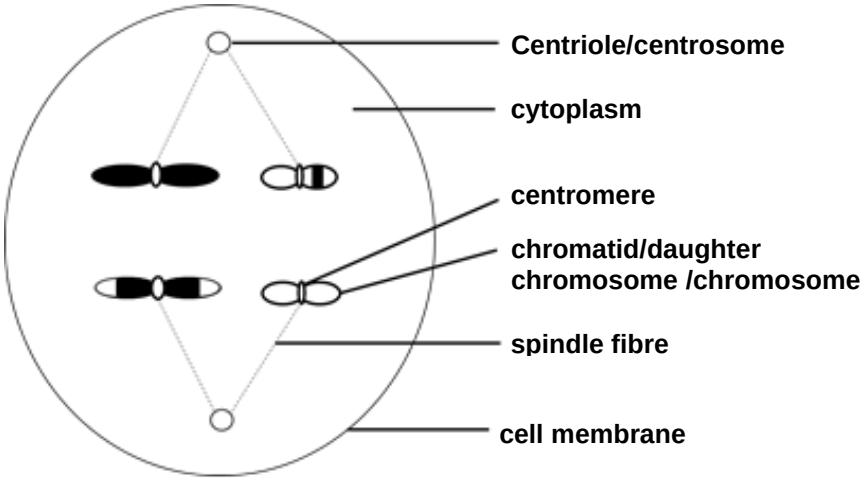


Diagram rubric:		Mark
C	Caption including Anaphase II/2	1
P	Diagram – Position of chromosomes: One large and one small unreplicated Chromosomes /chromatids/daughter chromosomes pulled to opposite poles - Showing a clear gap between chromatids at the equator of the cell.	1
S	Diagram – Shading: Correct shading of <u>all chromatids/daughter chromosomes /Unreplicated chromosomes</u>	1
L	Any two correct labels	2
		5

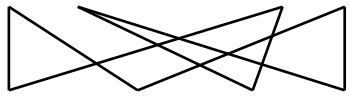
(5)

(14)

2.4 2.4.1 4 ✓/four (1)

2.4.2 3 ✓/three (1)

2.4.3 **P_1** Phenotype FH/hypercholesterolemia x without FH/ hypercholesterolemia ✓
Genotype Tt x tt ✓
Meiosis
Gametes T, t x t, t ✓
Fertilisation



F_1 Genotype Tt Tt tt tt ✓

F_1 Phenotype 2 with FH/hypercholesterolemia: 2 Without FH/ hypercholesterolemia ✓ (accept simplified ratio)

Probability: **50%*✓** of having a child without FH/hypercholesterolemia
(***Compulsory mark**)
P_1 and F_1 ✓
Meiosis and fertilisation ✓

*__Compulsory 1__ + Any 5

OR

P_1
Phenotype FH/hypercholesterolemia x without FH/hypercholesterolemia ✓
Genotype Tt x tt ✓
Meiosis
Fertilisation

Gamete	T	t
t	Tt	tt
t	Tt	tt

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

F_1 Genotype Tt Tt tt tt ✓
F_1 Phenotype 2 FH/ hypercholesterolemia: 2 without FH/ hypercholesterolemia ✓ (accept simplified ratio)
Probability: 50% ***✓** of having a child without FH/hypercholesterolemia
(***Compulsory mark**)
P_1 and F_1 ✓
Meiosis and fertilisation ✓

***__Compulsory__** 1 + Any 5 (6)
(8)

2.5 2.5.1 Number of lactose intolerant people in country B

$= \frac{12}{100}$ ✓ x 190 ✓million **OR** $\frac{12}{100}$ ✓ x 190 000 000 ✓

= 22,8 million ✓ or 22 800 000 ✓ (3)

2.5.2 E ✓ (1)

2.5.3 Smallest sample size ✓
only tested 20 people ✓ Any (1)

2.5.4
- Test on the same number of people/same sample percentage in each country ✓
- Use the same lactose intolerance test on every person ✓
- Test each person at the same time of the day ✓
- All people should consume the same diet ✓
- Same time frame for testing in each country ✓
- Same amount of milk drunk each day ✓
- Same source of milk used ✓

(Mark first TWO only) (2)

2.5.5
- Decide on which people to select ✓/sample size for the investigation
- Ask permission from participants✓ / ethics committee/ hospitals
- Decide which countries consume milk to include ✓in the investigation
- Decide on a venue to conduct the tests ✓
- Decide on a testing method ✓
- Decide a method to record results ✓
- Decide on the type of diet all participants need to follow ✓
- Decide on which hospitals to consult, gather and use data which they can provide ✓

(Mark first TWO only)
(Do not accept controlled variables) (2)
(9)
[50]

QUESTION 3

3.1 3.1.1 Cross/Mate/breed East Friesian ✓ sheep for bare backsides ✓ and Cheviot ✓ sheep for bare legs ✓

Select offspring with both bare legs and backsides ✓/have the same characteristics as both parents.

Continue this process for many generations✓/the process is repeated for many generations/offspring can be inbred Any (5)

3.1.2

Natural selection	**Selective breeding**
The environment or nature is the selective force ✓	Humans represent the selective force ✓
Selection is in response to suitability to the environment ✓/ Species benefit from organisms that survive.	Selection is in response to satisfying human needs ✓/ Humans benefit from organisms produced
Occurs within a species ✓	May involve one or more species ✓

(Mark first TWO only)

1 mark for table (T ✓) + (Any 2 x 2) (5)

3.1.3. - Reduced genetic variation ✓/gene pool may increase susceptibility to disease in the population ✓

- Reduced wool ✓ on head/legs/abdomen/backside means less wool for farmers to sell ✓/less money for farmers

- Exposed skin ✓ on the head/legs/abdomen/backside of sheep is less protected ✓ against damage/injuries/sunburn/insect bites

- Increase in genetic disorders due to inbreeding ✓so fewer sheep survive ✓

(Mark first ONE only)
(Must be written as a cause-effect statement) (2)
(12)

3.2 3.2.1 (a) Lamarck ✓ (1)

(b) Acquired characteristics of the sword size cannot be inherited ✓ because they are not part of the genotype ✓/not in the genes/only part of the phenotype/ sword size
OR
The constant use of the sword ✓of a swordfish will not make the sword increase in size ✓
OR
The swordfish could not chose to grow its sword ✓as it got larger due to environmental pressure ✓ (2)
Mark FIRST ONE only

3.2.2 In a large population of ancestral swordfish:

- There was variation in sword length ✓
- Some swordfish had a longer sword, and some swordfish had a shorter sword ✓
- Due to **competition for food ✓*/less prey/less food is available**
- The swordfish with a longer sword was able to injure/capture prey ✓
- and survived ✓
- while the swordfish with a shorter sword injured/captured less prey ✓
- and many died ✓
- Swordfish with longer swords survived and reproduced ✓
- and passed the allele for a long sword to their offspring ✓
- The next generation will therefore have a higher proportion of individuals with a long sword ✓

*** Compulsory mark + Any 5** (6)
(9)

3.3 3.3.1 **Genus names must have a CAPITAL LETTER, and all species names MUST be written in LOWERCASE.**
Surnames only of scientists will be accepted.

(a) *Australopithecus afarensis ✓/A. afarensis* (1)
(b) Lucy ✓ (1)
(c) Donald Johanson ✓ (1)

OR

(a) *Australopithecus prometheus ✓/A. prometheus* / *Australopithecus africanus ✓/A. africanus* (1)
(b) Little Foot ✓ (1)
(c) Ron Clarke ✓/Stephen Motsumi/Nkwane Molefe (1)

OR

(a) *Australopithecus africanus ✓/A. africanus* (1)
(b) Taung child ✓ (1)
(c) Raymond Dart ✓ (1)

OR

(a) *Australopithecus africanus ✓/A. africanus* (1)
(b) Mrs Ples ✓/ Mr Ples (1)
(c) Raymond Dart ✓/Robert Broom/Ron Clarke (1)

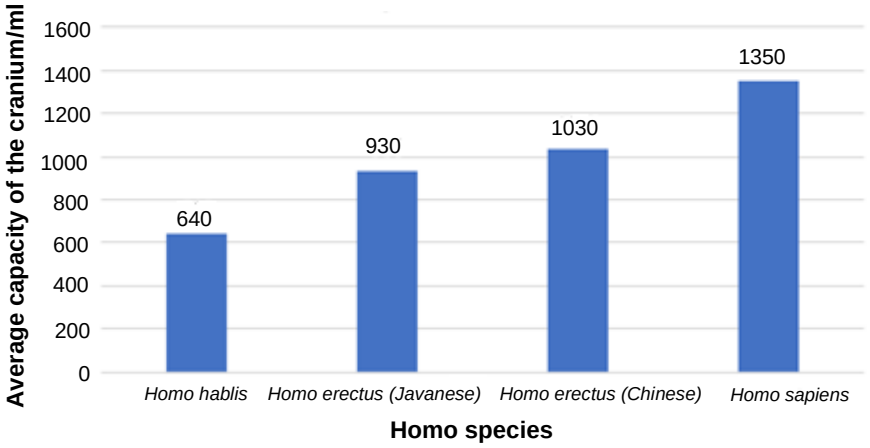
OR

(a) *Australopithecus* sediba ✓/*A. sediba* (1)
(b) Karabo ✓ (1)
(c) Lee Berger ✓ (1)

3.3.2
- Allows for a bigger brain ✓
- Development of speech ✓/communication
- Higher intelligence ✓
- Complex behaviour ✓
- Quick processing of information ✓
- Process large amounts of information ✓

(Mark first TWO only) (2)

3.3.3 Bar graph showing the average cranium capacity of different *Homo species*



Criteria for the assessment of the graph:

CRITERIA	ELABORATION	SYMBOL	MARKS
Correct type of graph	Bar graph drawn	**(T)**	**1**
Caption of graph	Both variables included (average cranium capacity and different *Homo* species)	**(C)**	**1**
Axes labels	Correct label and unit for x- and y-axes	**(L)**	**1**
Scale of x- and y- axes	Equal spacing and correct scaling on x- and y-axes and equal width of bars	**(S)**	**1**
Plotting of points	(If *Australopithecus* and/or *Paranthropus* are plotted – no marks are awarded for these bars) 1 to 3 **<u>required</u>** (***Homo***) bars plotted correctly Only 4 (***Homo***) **<u>required</u>** bars plotted correctly	**(P)**	 **1** **2**

(6)

NOTE: If the wrong type of graph is drawn, marks will be lost for "correct type of graph".

3.3.4
- Analysis of mutations ✓
- in mitochondrial DNA ✓/mtDNA in mitochondria
- is inherited only from the female ✓/maternal line
- Shows that the oldest female ancestors ✓
- of humans/*Homo erectus* are from Africa ✓
- Chinese and African *Homo erectus* fossils ✓share similar mutations in mitochondrial DNA/mtDNA ✓

Any (3)
(14)

3.4 3.4.1 Question removed

3.4.2 Homologous ✓ structure (1)

3.4.3
- A population of smaller flighted birds species flew long distances **to different continents*** ✓ **/ became separated by the sea**
- causing the population to split into two. ✓
- There is no gene flow between the two populations. ✓
- Since each population may be exposed to different environmental conditions ✓/the selection pressure may be different/DNA mutations
- natural selection occurs independently in each of the two populations ✓
- such that the individuals of the two populations become very different from each other ✓
- genotypically and phenotypically. ✓
- Even if the two populations were to mix again ✓
- they will not be able to interbreed. ✓

ONE compulsory mark* + Any 6 (7)
(8)

3.5 3.5.1 Punctuated equilibrium ✓ (1)

3.5.2
- Evolution involves longer periods time where species do not change /or change gradually (known as equilibrium) through natural selection ✓✓
- This alternates with (is punctuated by) short periods of time where rapid changes occur through natural selection ✓✓ (4)

(5)

[48]

TOTAL SECTION B: 98

TOTAL: 148