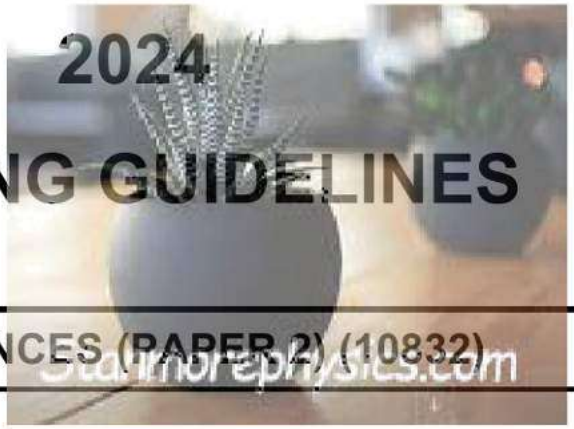
GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PREPARATORY EXAMINATION



2024

MARKING GUIDELINES

LIFE SCIENCES (PAPER 2) (10832)

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13 pages

PRINCIPLES RELATING TO THE MARKING OF LIFE SCIENCES

1. **If more information than marks allocated is given**
   Stop marking when maximum marks are reached and place a wavy line and 'max' in the right-hand margin.

2. **If, for example, three reasons are required and five are given**
   Mark only 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 part.

4. **If comparisons are asked for but 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 the sequence and links are correct, credit. Where the 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 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 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 memo discussion meeting.

14. **If only the letter is asked for and only the name is given (and vice versa)**
Do not credit.

15. **If units are not given in measurements**
Candidates will lose marks. Marking guidelines 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 learner's 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 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 B ✓✓

1.1.2 B ✓✓

1.1.3 D ✓✓

1.1.4 A ✓✓

1.1.5 B ✓✓

1.1.6 C ✓✓

1.1.7 A ✓✓

1.1.8 B ✓✓

1.1.9 C ✓✓

(9 x 2) **(18)**

1.2 1.2.1 Recessive ✓

1.2.2 Peptide✓ bond

1.2.3 Gene ✓

1.2.4 Cloning ✓

1.2.5 Continuous ✓ variation

1.2.6 Biogeography ✓

1.2.7 Lamarck ✓

(7 x 1) **(7)**

1.3 1.3.1 A only ✓✓

1.3.2 Both A and B ✓✓

1.3.3 None ✓✓

(3 x 2) **(6)**

1.4	1.4.1	(a)	(Robert) Broom ✓	(1)
		(b)	(Ron) Clarke ✓/(Stephen) Motsumi/(Nkwane) Molefe	(1)
	1.4.2		Sterkfontein ✓	(1)
	1.4.3		*Australopithecus sediba* ✓/*A. sediba*	(1)
	1.4.4		mitochondrial DNA ✓/mtDNA	(1)
				(5)
1.5	1.5.1		Interphase ✓	(1)
	1.5.2		Double helix ✓	(1)
	1.5.3	(a)	D ✓ Nucleotide ✓	(2)
		(b)	C ✓ Deoxyiribose ✓ sugar	(2)
		(c)	A ✓ Adenine ✓	(2)
				(8)
1.6	1.6.1	(a)	A ✓	(1)
		(b)	Both ✓/A and B	(1)
	1.6.2		More forward positioned foramen magnum ✓ S-shaped vertebral column ✓ Wider and shorter pelvis ✓	(3)
	1.6.3		Eyes (sockets) in front ✓ of the skull	(1)
				(6)

TOTAL SECTION A: 50

SECTION B
QUESTION 2

2.1 2.1.1 **Transcription ✓***
- 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. ✓

***1 Compulsory mark** + Any 4 (5)

2.1.2 UGU ✓ (1)

2.1.3 Cysteine ✓ (1)

2.1.4
- The base triplet TGT will become TGC ✓
- therefore, the mRNA/codon changes from ACA to ACG ✓
- which codes for the same amino acid ✓/Threonine.
- The protein will not be affected. ✓/The same protein will be coded for. (4)

(11)

2.2 2.2.1
- It overcomes the doubling effect of fertilisation ✓ by halving the chromosome number ✓, thus maintaining a constant chromosome number from one generation to the next. ✓

OR

- It introduces genetic variation ✓ through crossing over and the random arrangement of chromosomes, ✓ thus increasing a species chance of survival ✓. (Any 1 x 3) (3)

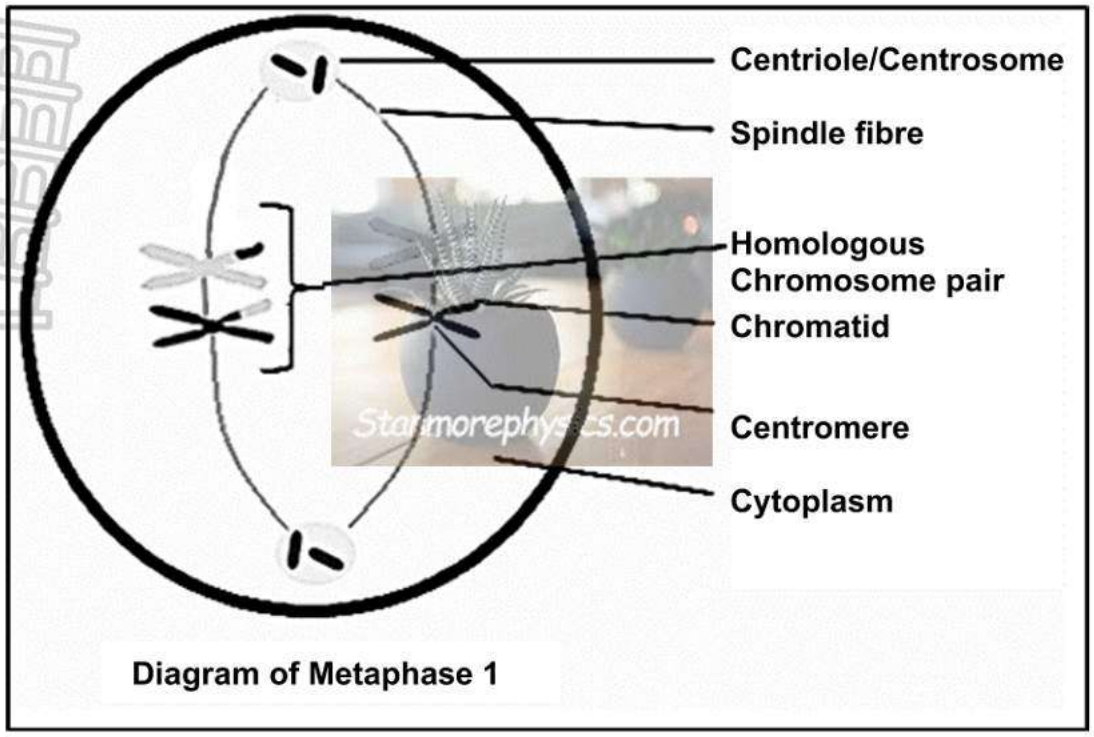
2.2.2

MEIOSIS I	MEIOSIS II
The chromosomes arrange at the equator of the cell in homologous pairs. ✓	Chromosomes line up at the equator of the cell individually. ✓
The chromosome number is halved✓	The chromosome number remains the same✓
Whole chromosomes move to opposite poles of the cell. ✓/ Homologous pairs of chromosomes separate to opposite poles of the cell	Chromatids/daughter chromosomes move to opposite poles of the cell. ✓
Two cells form✓ at the end of this division.	Four cells are formed✓ at the end of this division.
Crossing-over takes place. ✓	Crossing-over does not take place. ✓

(Mark first TWO only)

1 mark for table (T ✓) + (2 x 2) (5)

2.2.3



Criteria for assessing the diagram:

Criteria	Elaboration	Letter	Mark
Caption	Metaphase I	**C**	(1)
Drawing	Correct representation of **TWO** homologous pairs of chromosomes at the equator. No nuclear membrane present.	**D**	(1)
Shading	Diagram – Shading: Correct shading of all chromosomes.	**S**	(1)
Labels	ANY 2 correct labels	**L**	(2)
	TOTAL:		**(5)**

(5)

2.2.4 Non-disjunction ✓
The chromosomes (of a homologous pair) failed to separate ✓ during Anaphase I✓ (3)

2.2.5 No ✓ (1)

2.2.6
- This is not a human cell. ✓
- As the zygote/offspring will only have 5 chromosomes ✓/it does not have 47 chromosomes.
- The extra chromosome is not on pair 21. ✓ Any (2)

(19)

2.3 2.3.1 - Restriction fragment-length polymorphism ✓/RFLP
- Polymerase chain reaction ✓/PCR (2)

2.3.2 Baby 2 ✓ (1)

2.3.3 Each bar in the DNA profile of baby 2, ✓ matches with a bar of either the mom's or the dad's DNA profile ✓

OR

50%/3 of the DNA bars of baby 2 matches with the mom's ✓ and
50%/3 match with the dad's DNA bars. ✓ Any (1 x 2) (2)

2.3.4 - Identify crime suspects ✓/criminals
- Identification of genetic disorders ✓
- Matching tissues for organ transplants ✓
- Tracing missing persons ✓
- Identifying dead bodies ✓
- Establishing family relations ✓

(Mark first ONE only) (1)
(6)

2.4 2.4.1 A genetic cross involving body colour and wing length. ✓✓

OR

A genetic cross involving 2 characteristics✓, body colour and wing length✓ (2)

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2.4.2 (Law of) Independent Assortment ✓
(Law of) Segregation ✓ (2)

2.4.3 (a) tl ✓ (1)
(b) black body (colour) with long wing (length) ✓✓ (2)
(c) TtLL ✓ (1)
(8)

2.5 2.5.1 (a) B ✓ (1)
(b) A ✓ (1)

2.5.2 - **Punctuated equilibrium.** ✓ *
- Evolution involves long periods of time where species do not change ✓ or change gradually through natural selection (known as equilibrium)
- This alternates with (is punctuated by) short periods of time where rapid changes occur forming new species ✓
- through natural selection ✓

***1 Compulsory mark** + Any 2 (3)

2.5.3 Transitional ✓ fossils (1)
(6)
[50]

QUESTION 3

3.1 3.1.1 Artificial selection ✓/selective breeding (1)

3.1.2
- Decreases biodiversity ✓/the gene pool/genetic variation.
- Increases genetic disorders✓ Any (1)

3.1.3
- Humans/farmers select✓
- maize/teosinite/plants with more kernels ✓/bigger ears of corn/more rows of kernels
- these were interbred ✓/They planted seeds from those plants
- Over thousands of years ✓ they developed modern maize. Any (3)

3.1.4
- More rows of kernels are produced✓/higher yields produced,
- Which can be sold for a higher prices ✓/to generate more profit. (2)

(7)

3.2 3.2.1
- Similar organisms that are capable of interbreeding ✓
- to produce fertile offspring ✓ (2)

3.2.2
- Breeding at different times of the year ✓
- Species-specific courtship behaviour ✓
- Prevention of fertilization ✓ Any (2)

3.2.3
- When the population of porkfish became separated by the (narrow) **strip of land** ✓/**Isthmus** (of Panama)
- then the population split into two. ✓
- There was no gene flow between the two populations ✓
- some porkfish were exposed to **warmer waters** while others were exposed to **cooler waters** ✓/were exposed to **different temperatures of water**.
- Natural selection occurred independently in each of the two populations, ✓
- such that the individuals of the two populations become very different ✓
- genotypically and phenotypically. ✓
- The two populations are now different species ✓ Any (7)

(11)

3.3 3.3.1 Pedigree ✓ diagram (1)

3.3.2 X^TX^T ✓
X^TX^t ✓ (2)

3.3.3
- As individual C is heterozygous ✓/X^TX^t
- She inherited a recessive allele/X^t from her father/B who is affected, ✓
- she must have inherited a dominant allele/X^T from her mother ✓/A
- The recessive allele is masked by the dominant allele ✓
- Therefore, she is not affected by the condition (Ichthyosis)✓/shows the unaffected phenotype Any (4)

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3.3.4 Males only need to inherit one recessive allele ✓ while a female needs to inherit two recessive alleles ✓ to be affected.

OR

In a male the Y-chromosome does not carry the allele and cannot mask the recessive/affected allele. ✓
But in a female one recessive allele can be masked by a dominant allele ✓ since she has 2 X-chromosomes. (2)

3.3.5 **$P_{1/2}$** Phenotype Male without Ichthyosis/ Unaffected Male x Female without Ichthyosis ✓/ Unaffected Female

Genotype X^TY x X^TX^t ✓

Meiosis

G/Gametes X^T, Y x X^T, X^t ✓

Fertilisation

$F_{1/2}$ Genotype $X^T X^T$, $X^T Y$, $X^t Y$, $X^T X^t$ ✓*

Phenotype: Females without Ichthyosis/ Unaffected Female,
Male without Ichthyosis/ Unaffected Male,
Male with Ichthyosis✓/ Affected Male

P_1 and F_1 ✓ or P_2 and F_2

Meiosis and fertilisation ✓

***1 Compulsory mark** + Any 5

OR

$P_{1/2}$ Phenotype: Male without Ichthyosis/ Unaffected Male x Female without Ichthyosis ✓/ Unaffected Female

Genotype: X^TY x X^TX^t ✓

Meiosis

Fertilisation

Gametes	X^T	Y
X^T	X^T X^T	X^T Y
X^t	X^T X^t	X^tY ✓*

1 mark for correct gametes
1 mark for correct CIRCLED genotype

$F_{1/2}$ Phenotype: Females without Ichthyosis/ Unaffected Female,

Male without Ichthyosis/ Unaffected Male,

Male with Ichthyosis✓/ Affected Male

P_1 and F_1 ✓ or P_2 and F_2

Meiosis and fertilisation ✓

***1 Compulsory mark** + any 5

(6)
(15)

3.4 3.4.1 Incomplete ✓ dominance (1)

3.4.2 The green fish represents an intermediate phenotype ✓. (1)

3.4.3 (a)
- They collected 100 offspring each year✓/ 500 offspring
- Calculated average of the offspring over 5 years✓.
- Repeated the investigation 5 times✓/ They conducted the investigation over 5 years

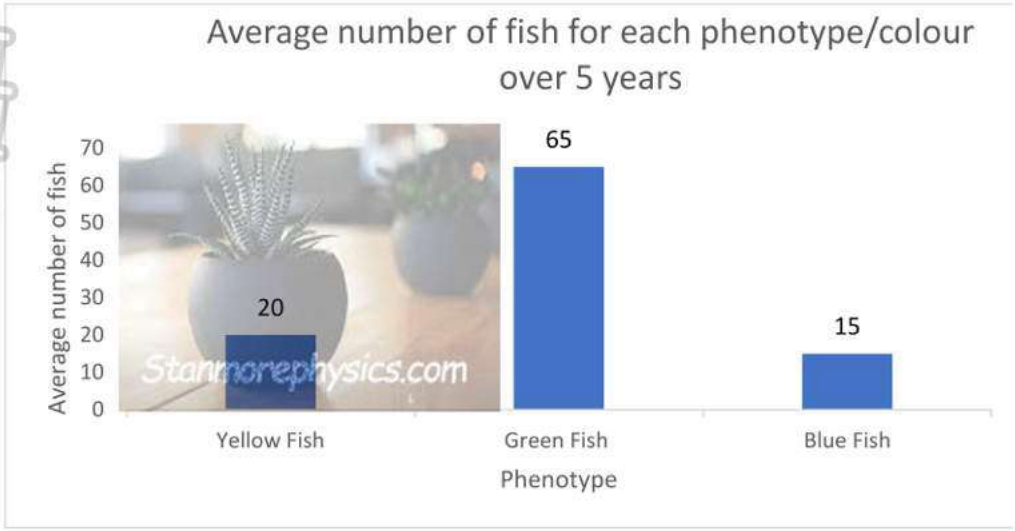
(Mark first TWO only) (2)

(b) Only yellow fish mated with blue fish ✓/both colour parents were homozygous **(Mark first ONE only)** (1)

3.4.4
- Decide when the best time is to allow for mating of the fish. ✓
- Decide how to safely incubate/store offspring. ✓
- Decide what food to provide the offspring. ✓
- Decide on the sample size. ✓
- Decide how to record results. ✓
- Decide on the time/date/season, of the sampling✓
- Get permission from animal ethics✓

(Mark first TWO only) (2)

3.4.5



Criteria for assessing the graph:

Criteria	Elaboration	Symbol	Mark
Caption	Includes both the variables: **Phenotype/colour** and **average number of fish over 5 years**	**C**	1
Type of graph	Bar graph drawn	**T**	1
Label	Correct labels of X and Y axis	**L**	1
Scale	Correct scale of Y axis and equal width of bars and equal spacing between bars	**S**	1
Plotting	1 – 2 correct All 3 correct	**P**	1 2

(6)
(13)

If a histogram or line graph is drawn, marks will be lost for:

- Type of graph (T) AND
- Scale (S)

If the axes are transposed:

- Candidates can get all marks if the labels are also swapped and the bars are horizontal.
- If the labels are not corresponding, then:
  - Marks will be lost for label (L) and scale (S)
  - Plotting can get credit if coordinates are correct for given labels.

3.5
- Some (offspring) have favourable characteristics ✓, and some do not.
- When there is a change in the environmental conditions ✓/if there is competition,
- organisms with favourable characteristics/more suited to the environment, survive. ✓
- Whilst organisms with unfavourable characteristics/less suited to the environment, die. ✓
- The organisms that survive, reproduce ✓
- and pass on the allele for the favourable characteristic to their offspring. ✓

Any (4)
[50]

TOTAL SECTION B: 100

TOTAL: 150

Additional notes to the making of Gauteng Prep P2 2024

1.1. If the learner gave more than one answer, they will get no marks e.g. 1.1.1 B/C **X**

1.2 Note the tick placement on the compulsory word.

1.4.3 The genus name MUST be capitalized and the species/specific name in lowercase. Underlining of scientific names is the correct biological convention. Learners are encouraged to underline them; however, we will not penalize the correct answer that isn't underlined.

Accept just *sediba* (NOT *Sediba*) NOTE: this is a concession only for this paper, since the genus name was given in the stem of the question. It will NOT be accepted in the future.

1.6.2 Accept: S-shaped spine✓ NO MARK for S-shaped spinal cord **X**

Accept: In humans, the shape of the pelvis means the femur is angled inwards✓ for maximum load bearing

2.1.1 **"Double helix DNA"** Must be included with unwinds to get the first mark

2.3.3 Learner cannot state "some bars match the mom and some match the dad" they have to account for ALL bars. It is also incorrect to indicate that the baby's DNA profile matches the mom and the dad (the profile refers to ALL of the bars of an individual)

2.3.4 DO NOT ACCEPT:

- Solving crimes **X**
- Treating genetic disorders **X**
- For organ transplants **X**
- Tracking missing people **X**
- Paternity testing/determining parents **X** ("other uses")

3.2.3 If the word species is used in place of population, the learner will lose the mark for all bullets except for the last one.

3.3.1 Genetic lineages **X**

3.3.5 The compulsory mark is for the circled genotype, NOT for the entire $F_{1/2}$ genotype

3.5 Where an example is used, accept if used in the correct context

Accept change in selective pressure✓ (in place of bullet 2)