education

Department of Education
FREE STATE PROVINCE

# PREPARATORY EXAMINATION

## GRADE 12

# LIFE SCIENCES P2

## SEPTEMBER 2022

## MARKS: 150

## MARKING GUIDELINES

**These marking guidelines consist of 11 pages.**

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## 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 a part of it is required**
   Read all and credit the relevant part.

4. **If comparisons are asked for, but descriptions are given**
   Accept if the 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 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 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 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 national memo discussion meeting.

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

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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 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 applies to all official languages.

19. **Changes to the memorandum**
No changes must be made to the memoranda. The Provincial Internal Moderator must be consulted.

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## SECTION A

## QUESTION 1

| | | | | |
|---|---|---|---|---|
| 1.1 | 1.1.1 | B ✓✓ | | |
| | 1.1.2 | C ✓✓ | | |
| | 1.1.3 | C ✓✓ | | |
| | 1.1.4 | A ✓✓ | | |
| | 1.1.5 | D ✓✓ | | |
| | 1.1.6 | A ✓✓ | | |
| | 1.1.7 | A ✓✓ | | |
| | 1.1.8 | D ✓✓ | | |
| | 1.1.9 | C ✓✓ | | |
| | 1.1.10 | C ✓✓ | (10 x 2) | **(20)** |
| 1.2 | 1.2.1 | Gene ✓ | | |
| | 1.2.2 | Gametogenesis ✓ | | |
| | 1.2.3 | Phylogenetic ✓ tree | | |
| | 1.2.4 | Dominant ✓ | | |
| | 1.2.5 | Biogeography ✓ | | |
| | 1.2.6 | Species ✓ | | |
| | 1.2.7 | Opposable thumb✓ | | |
| | 1.2.8 | Theory ✓ | | |
| | 1.2.9 | Non-disjunction ✓ | | |
| | 1.2.10 | Incomplete ✓ dominance | (10 x 1) | **(10)** |
| 1.3 | 1.3.1 | Both A and B ✓✓ | | |
| | 1.3.2 | A only ✓✓ | | |
| | 1.3.3 | Both A and B ✓✓ | (3 x 2) | **(6)** |
| 1.4 | 1.4.1 | Dihybrid cross ✓ | | (1) |
| | 1.4.2 | (a) bbnn ✓✓ | | (2) |
| | | (b) Bitter ✓ | | (1) |
| | | (c) BN Bn bN bn ✓✓ | | (2) |
| | 1.4.3 | bbNn is sweet with yellow spots ✓<br>Bbnn is bitter with no yellow spots ✓ | | (2)<br>**(8)** |
| 1.5. | 1.5.1 | (a) mRNA ✓ | | (1) |
| | | (b) Peptide bond ✓ | | (1) |
| | | (c) GAG ✓✓ | | (2) |
| | 1.5.2 | Ribosome ✓ | | (1) |
| | 1.5.3 | Uracil ✓ | | (1)<br>**(6)** |

**TOTAL SECTION A: 50**

## SECTION B

## QUESTION 2

2.1 2.1.1 GTA ✓✓ (2)

2.1.2 Cysteine ✓ and Threonine ✓ (2)

2.1.3 **The process is translation ✓***
The codon **UAU** ✓of mRNA
was exposed on the ribosome ✓
The tRNA with the complementary anticodon **AUA** ✓
brought the amino acid **tyrosine** ✓
from the cytoplasm to the ribosome ✓
It was then bonded to the neighbouring/previous amino acid by a peptide bond ✓
**(✓* compulsory mark + any 4)** (5)
**(9)**

**Credit compulsory mark and any 4 points in sequence**
**NB. No credit for generic description of translation process if it does not relate to amino acid 11 in the table.**

2.2 Structural difference between DNA and RNA

| DNA | RNA |
|---|---|
| Deoxyribose sugar ✓ | Ribose sugar ✓ |
| Nitrogenous base Thymine ✓ | Nitrogenous base Uracil ✓ |
| Double stranded ✓ | Single stranded ✓ |
| Helix structure✓ | Straight molecule✓ |

1 mark ✓ for table and any 2 x 2 **(5)**

**Mark first TWO only**

2.3 2.3.1 A diploid body cell ✓✓ (2)

2.3.2 It is a haploid cell ✓/Does not have the desired characteristic (1)

2.3.3
- The diploid ✓ embryonic cell removed from an embryo of sheep V
- multiplied by mitosis ✓
- Producing identical cells ✓
- The identical nuclei of the cells were removed and implanted into empty ova ✓
- which developed into genetically identical embryos ✓ /lambs

Any 4 (4)

2.3.4 The nucleus/genetic material originated from sheep V ✓/ the genetic material of sheep W was removed from the ova (1)

2.3.5
- Produce superior livestock ✓
- Produce livestock more rapidly ✓
- As market changes, livestock can be bred to respond to market changes and demands ✓

**Mark first TWO only** Any 2 (2)

2.3.6
- Against ethical/moral believes ✓
- It is not safe don't know what can happen to clone ✓/ unsure of long- term effects
- Against nature ✓
- Potential health impact✓
- Expensive ✓ (1)
- Reduce genetic variation ✓ **(11)**

**Mark first TWO only** Any 1

2.4 2.4.1
- There are 3 different alleles ✓ that determines blood groups
- An individual only inherit two alleles. ✓ (2)

2.4.2 $I^Ai$ ✓✓ (2)

2.4.3
- The baby's genotype is ii ✓/homozygous for the recessive allele
- The baby must inherit one allele for type O blood/i from each parent ✓
- The father/Mr Wilson's genotype is AB and does not have the recessive/ i allele ✓ (3)

2.4.4
- Compare the DNA profiles of the daughter, mother and father ✓
- Identify the DNA bands of the daughter that are the same as that of the mother ✓
- All ✓ the remaining bands of the daughter must be the same as that of Mr Wilson ✓/the father (4)

**(11)**

2.5
- Males have one X – chromosome and one Y - chromosome on the gonosome✓/ 23 chromosome pair
- Females have two X- chromoomes on the gonosomes ✓ / 23 chromosome pair
- All ova have an X- chromosome from the gonosome ✓
- If an ovum is fertilized by an X-chromosome bearing sperm a female/girl is formed ✓ **(4)**
- If an ovum is fertilized by a Y-chromosome bearing sperm a male/boy is formed ✓ Any 4

2.6 2.6.1
- The population of a single species of squirrels becomes separated by a geographical barrier, (**the river)** ✓*
- The population split into two populations. ✓
- There was no gene flow between the two populations ✓
- Since each population was exposed to different environmental conditions ✓/the selections pressure was different
- natural selection occured independently ✓ in each of the two populations
- such that the individuals of the two populations became very different ✓ from each other
- genotypically and phenotypically ✓
- Even if the populations are to mix again ✓
- they will not be able to interbreed ✓
- The two populations are now different species

**1 Compulsory mark +** Any 6 (7)

2.6.2
- Breeding at different times of the year ✓
- Species-specific courtship behaviour ✓
- Plant adaptations to different pollinators ✓
- Infertile offspring ✓
- Prevention of fertilisation ✓

**Mark first THREE only** Any 3 (3)

**(10)**

**(50)**

## QUESTION 3

3.1 3.1.1 (a) A/B ✓ **( mark first one only)** (1)

(b) C ✓ (1)

(c) C ✓ (1)

(d) A ✓ (1)

3.1.2 Large brain give rise to:
- Well-developed hand-eye coordination ✓
- Capacity of language ✓
- Improved intelligence ✓
- The ability to receive and process more stimuli from the environment ✓
- Better decision making ✓

**Mark first TWO only** Any 2 (2)

3.1.3
- Smaller cranium size ✓
- Brow ridges are well developed ✓
- Cranial ridges present ✓
- Larger jaws ✓
- Sloping face ✓
- Less developed chin ✓

**Mark FIRST THEE only** Any 3 (3)

3.1.4 Fossil evidence ✓
Genetic evidence ✓ (2)
**(11)**

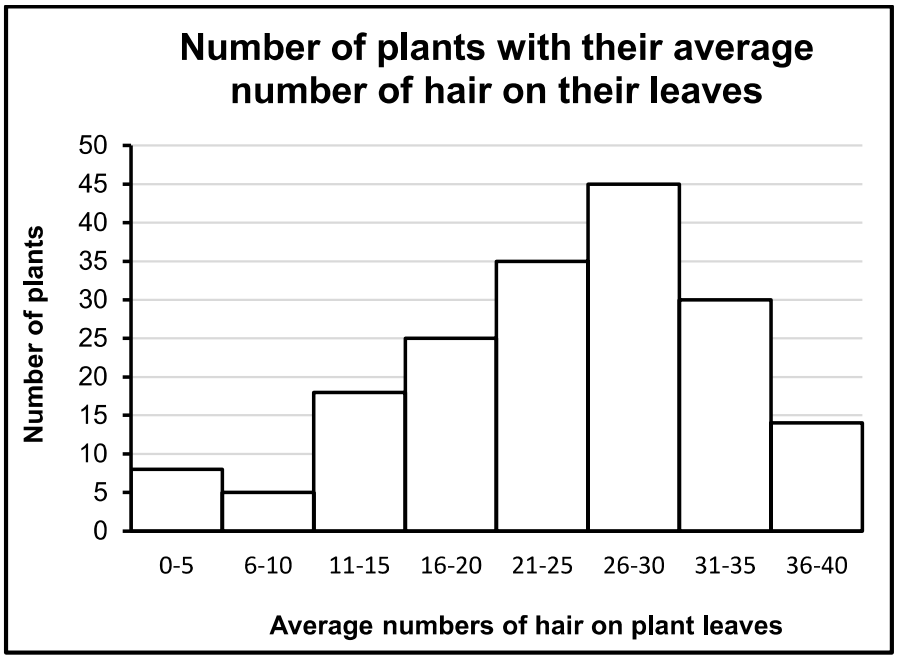
3.2 3.2.1 (a) With OR without artificial selection ✓ (1)

(b) Number of plants with more hairs on their leaves ✓ (1)

3.2.2 Repeat the investigation ✓
Increase the sample size ✓
**Mark FIRST ONE only** (1)

3.2.3 With artificial selection the number of plants with more hairs on their leaves increases ✓✓ (2)

3.2.4




| | Mark Allocation |
|---|---|
| Correct type of graph (T) | 1 |
| Caption for graph with both variables ( C ) | 1 |
| Correct label for X-axis and label for Y-axis (L) | 1 |
| Correct scale for X-axis, scale for Y-axis and width of bars (S) | 1 |
| Plotting of points (P) | 1 (1 to 7points correct)<br>2 (All 8 points correct) |
| **Note:** If the wrong graph is drawn, marks will be lost for 'correct type of graph' and correct scale. If axes are transposed, marks will be lost for labelling of X-axis and Y-axis. | |

(6)
**(11)**

3.3 3.3.1 Prophase II ✓ (1)

3.3.2 (a) B ✓ – chromosome ✓ (2)

(b) E ✓ – centromere ✓ (2)

3.3.3 (a) 4 ✓ (1)

(b) 2 ✓ (1)
**(7)**

3.4 3.4.1 (a) Unaffected male ✓ (1)

(b) $X^dY$ ✓ (1)

3.4.2 The recessive alleles are only carried on the X chromosome of the gonosome ✓/ 23 chromosome pair (1)

3.4.3

- Colour blindness is carried by a recessive allele ✓
- On the X-chromosome of the gonosome ✓
- Females have two X chromosomes on the gonosome ✓
- Females must inherit two copies of the recessive allele to show the disorder ✓/females who inherit only one of the recessive allele are still normal (4)

3.4.4 **$P_1$**

Phenotype : Colour blind female x Unaffected male ✓

Genotype : $X^dX^d$ x $X^DY$ ✓

*Meiosis*

**G**/gametes $X^d$, $X^d$ $X^D$, Y ✓

*Fertilization* 

**$F_1$** Genotype $X^DX^d$ $X^dY$ $X^DX^d$ $X^dY$ ✓

Phenotype 1 normal daughter :1 colour blind son ✓

**50% chance of having a colour blind son ✓***

$P_1$ and $F_1$ ✓

Meiosis and fertilization ✓

(✓***Compulsory** 1 + Any 5) (6)

**OR**

**$P_1$**
Phenotype: Colour blind female x Unaffected male ✓
Genotype: $X^dX^d$ x $X^DY$ ✓

Meiosis

Fertilization

| Gametes | $X^d$ | $X^d$ |
|---|---|---|
| $X^D$ | $X^D X^d$ | $X^D X^d$ |
| Y | $X^d Y$ | $X^d Y$ |

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

**$F_1$** Genotype $X^DX^d$ $X^dY$ $X^DX^d$ $X^dY$

Phenotype 1 normal daughter : 1colour blind son ✓

**50% chance of having a colour blind son ✓***

$P_1$ and $F_1$ ✓
Meiosis and fertilization ✓ (6)
(✓***Compulsory** 1 + Any 5) **(13)**

3.5 3.5.1
– Predators may mistake it ✓/avoid eating them
– because they resemble A. ochlea which has an unpleasant taste✓ (2)

3.5.2
– There was a variation in the appearance and taste of butterflies √
– The ***Amauris ochlea*** did have an unpleasant taste and the ***Hypolimnas deceptor*** that looks like the ***Amauris ochlea*** did not have an unpleasant taste√
– Predators feed on butterflies in this habitat √
– ***Hypolimnas deceptor*** that look like the ***Amairis ochlea*** with the unpleasante taste were avoided by predetors√ / predators did not prey on them
– they were mistaken by their appearance for unpleasant taste√
– the ***Hypolimnas deceptor*** survive√
– They reproduced and √ (6)
– Passed the alle of apperence/allele of looking similar to ***A. ochle*** to the offsprings√ **(8)**
– More ***H deceptor*** butterflies is in the next generation that look like ***A ochlea***.√ **[50]**

Any 6

**TOTAL SECTION B: 100**
**GRAND TOTAL: 150**

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