education

Department of Education
FREE STATE PROVINCE

PREPARATORY EXAMINATION

GRADE 12

LIFE SCIENCES P2

SEPTEMBER 2023

MARKS: 150

MARKING GUIDELINES

This marking guideline consists of 12 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 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 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 memorandum. The provincial internal moderator must be consulted.

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SECTION A
QUESTION 1

1.1	1.1.1	A ✓✓		
	1.1.2	D ✓✓		
	1.1.3	B ✓✓		
	1.1.4	A ✓✓		
	1.1.5	A ✓✓		
	1.1.6	B ✓✓		
	1.1.7	B ✓✓		
	1.1.8	D ✓✓		
	1.1.9	C ✓✓	(9 x 2)	**(18)**
1.2	1.2.1	Quadrupedalism✓		
	1.2.2	Peptide✓		
	1.2.3	Cranium✓		
	1.2.4	Gene mutation✓		
	1.2.5	Trisomy 21✓/Down Syndrome		
	1.2.6	Mitochondrial DNA✓/mt-DNA		
	1.2.7	Cloning✓		
	1.2.8	Co-Dominance✓		
	1.2.9	Homologous structures✓	(9 x 1)	**(9)**
1.3	1.3.1	Both A and B✓✓		
	1.3.2	A only✓✓		
	1.3.3	None✓✓	(3 x 2)	**(6)**
1.4	1.4.1	DNA profiling✓		(1)
	1.4.2	Baby 3✓✓		(2)
	1.4.3	– Identifying suspects in a crime✓ – Tracing missing persons✓ – Identifying genetic disorders✓ – Matching tissues for organ transplants✓ – Identifying dead persons✓ **(Mark first TWO only)**	Any	(2) **(5)**
1.5.	1.5.1	(a) Bacterial resistance✓ (b) Effect of antibiotics✓		(1) (1)
	1.5.2	Natural Selection✓/Punctuated Equilibrium		(1)
	1.5.3	Antibiotics✓		(1)
	1.5.4	Resistant Bacteria✓		(1)
	1.5.5	25%✓		(1) **(6)**

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1.6	1.6.1	a) 5✓	(1)
		b) 3✓	(1)
		c) 3✓	(1)
	1.6.2	a) Aa✓/AA✓	(2)
		b) Affected female✓	(1)
			(6)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1	2.1.1	(a) Homologous✓ chromosomes/bivalent	(1)
		(b) Centromere✓	(1)
		(c) Chromatid✓	(1)
	2.1.2	Crossing over✓	(1)
	2.1.3	Prophase I✓	(1)
	2.1.4	Ensures genetic variation✓	(1)
	2.1.5	– Chromosomes/chromatids arrange themselves randomly✓ – on either side of the equator✓ – during metaphase I✓/II	(3)
			(9)

2.2

Meiosis I	Meiosis II
Crossing over takes place✓	No crossing over takes place✓
In metaphase, the chromosomes align on the equator in homologous pairs✓	(In metaphase) chromosomes align singly✓ on the equator
During anaphase, chromosomes✓ move towards the poles	During anaphase, chromatids✓ move towards the poles
Homologous chromosomes in prophase I ✓	Chromosomes occur singly in prophase II ✓
The chromosome number is halved✓/changes from diploid to haploid	The chromosome number remains the same✓
Results in two daughter cells✓	Results in four daughter cells✓

(Mark first THREE only) Any 3 x 2 + 1 for table **(7)**

2.3 2.3.1 'Law' of use and disuse✓
'Law' of the inheritance of acquired characteristics✓ (2)

2.3.2
- Acquired characteristics✓
- are not inherited✓/do not cause any change to the DNA of an organism's gametes (2)

(4)

2.4
- The blood the of mother, possible father and the child must be compared✓
- If this shows that it is not possible that these parents can produce a child with his/her blood group✓
- then this man is not the father✓
- If this shows that it is possible that these parents can produce a child with his/her blood group✓
- then he may/ may not be the father✓
- because other males have the same blood group✓ (5)

Any **(5)**

2.5 2.5.1 The mapping of the exact position of all the genes in all the chromosomes of an organism/human✓✓ (2)

2.5.2 The breed of the dogs✓
(Mark first ONE only) (1)

2.5.3 **Calculations**

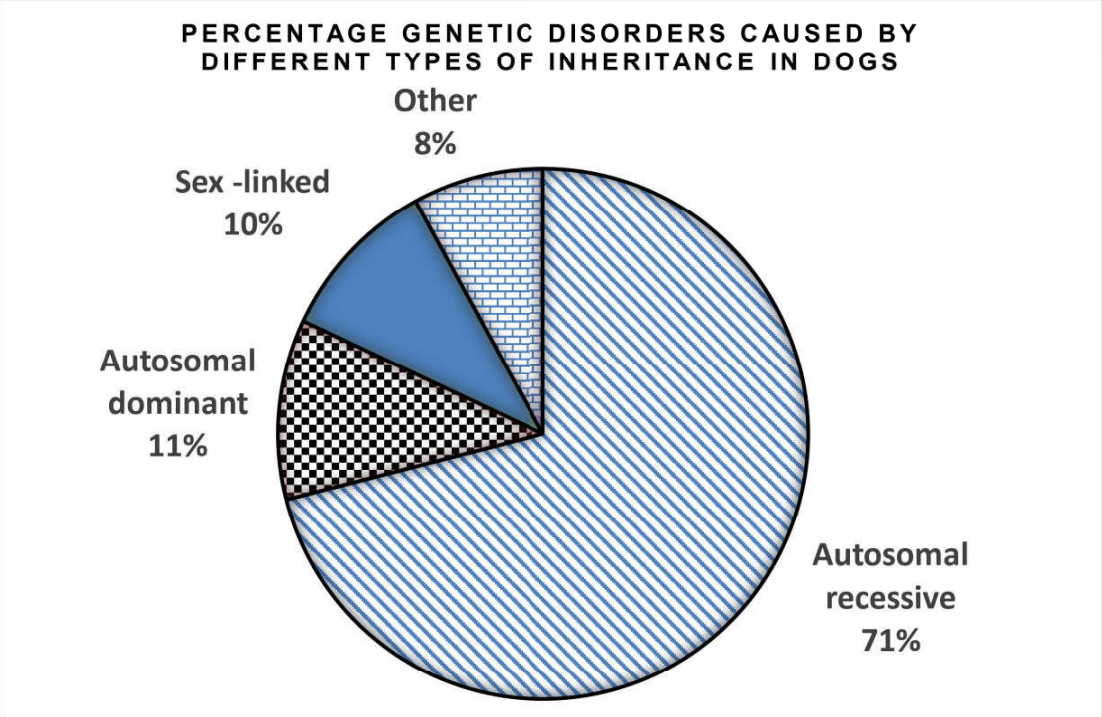
Total: 71 + 11 + 10 + 8 = 100

Autosomal recessive: 71/100 x 360 = 255.6°

Autosomal dominant: 11/100 x 360 = 39.6°

Sex-linked: 10/100 x 360 = 36°

Other: 8/100 x 360 = 28.8°



Criteria for marking graph

CRITERIA	MARK
Pie chart drawn **(T)**	1
Caption **showing the relationship between the two variables(H)**	1
Correct calculation **(C)** to determine the proportions for the labelled sectors	2
Plotting of Sectors **(P)** Correct proportions for labelled sectors 1–3 sectors drawn and labelled correctly All 4 sectors of the graph are drawn and labelled correctly	 1 2

(6)
(9)

2.6 2.6.1 (a) DNA✓ (1)

(b) Nucleolus✓ (1)

(c) tRNA✓ (1)

(d) 3✓ (1)

2.6.2 UCC✓✓ (2)

2.6.3 DNA Replication✓*
- The DNA (double helix) unwinds✓ and
- unzips✓/hydrogen bonds break
- to form two separate strands✓
- Both DNA strands serve as the templates✓
- to build a complementary DNA✓/(A to T and C to G)
- using free (DNA) nucleotides✓ from the nucleoplasm
- This results in two identical (DNA) molecules✓
- Each molecule consists of one original strand and one new strand✓ ***1 Compulsory** + Any 5 (6)

2.6.4
- mRNA forms during transcription✓
- by copying the coded message from DNA✓
- and moves out of the nucleus✓
- and attaches to the ribosome✓
- the anticodons on the tRNA match the codons on the mRNA✓

Any (4)
(16)

[50]

QUESTION 3

3.1
- The common ancestor of the original baobab population/the baobab population of Gondwanaland was separated into two populations✓
- by the **ocean/sea✓***
- There was no gene flow between the African baobab and Australian baobab✓/two baobab populations.
- Each baobab population were exposed to different environmental conditions✓/other selection pressures.
- Natural selections occur independently✓ in each of the two baobab populations.
- Such that the individuals of the two baobab populations become very different✓ from each other.
- genotypically and phenotypically✓
- even if the two baobab populations were to mix again✓
- they will not be able to interbreed.✓

The two baobab populations are now different baobab species (in the question) (No marks for this statement)

***1 Compulsory** + Any 5 **(6)**

3.2 3.2.1
- They use species-specific courtship behaviour✓*
- Males sing songs to attract female mates✓
- and females do not respond/recognise songs from other males✓

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

3.2.2
- Breeding at different times of the year✓
- Plant adaptations to different pollinators✓
- Producing infertile offspring✓
- Prevention of fertilisation✓

(Mark first TWO only) Any (2)
(5)

3.3 3.3.1 B✓ (1)

3.3.2
- The pelvis is short and wide✓
- to support the body weight of the upper body✓

(Mark first ONE only) (2)

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3.3.3
- Frees the arms✓ so that they could carry offspring✓/tools/food/manipulate things
- Allows the ability to see further✓ to spot danger✓/food
- Reduces the surface area exposed to the sun,✓ so, less heat is absorbed✓/less heat lost/improved thermoregulation
- Expose the genitals✓ to attract the opposite sex✓
- Efficient locomotion✓ allows travelling longer distances✓

(Mark first TWO only) Any 2 x 2 (4)
(7)

3.4 3.4.1 Hominidae✓ (1)

3.4.2 Diagram III✓ (1)

3.4.3
- The foramen magnum is in a more forward position✓
- The palate is more rounded✓

(Mark first TWO only) (2)

3.4.4
- The jaw/palate is rectangular in Diagram II✓ and rounded in Diagram III✓
- Large spaces between the teeth in Diagram II✓ and small/ no spaces between the teeth in Diagram III✓
- Large canines/teeth in Diagram II ✓ and small canines/ teeth in Diagram III ✓

(Mark first THREE only) Any 3 x 2 (6)

3.4.5
- This organism in Diagram II had a diet of hard, raw food✓
- and the organism in Diagram III has a diet of softer✓/ cooked food

(2)
(12)

3.5 3.5.1 Phenotype Black short fur✓ x White long fur✓ (2)

3.5.2 Gametes BH, Bh, bH, bh✓✓ (2)

3.5.3 (a) Black Short fur; Black Long fur; White Short fur; White Long fur✓✓ (2)

(b) Black fur✓ (1)

3.5.4
- Because of the random arrangement of chromosomes at the equator during meiosis✓/any one of two alleles of a characteristic can sort with any two of another characteristic
- the alleles of different genes move independently of each other into the gametes✓
- They can therefore appear in the gametes in different combinations✓

(3)
(10)

3.6 3.6.1
- Females lay many eggs✓ which will ensure that the ratios obtained will be reliable✓
- The eggs develop very quickly✓/7 to 14 days therefore, results will be obtained fast✓
- Can clearly differentiate between male and female✓ making it easy to breed✓
- Fruit flies survive and breed in small flasks✓ making it easy to observe and work with✓
- The food medium required is simple✓/cheap making it easy/cheap to conduct the investigation✓

(Mark first TWO only) (Any 2 x 2) (4)

3.6.2 **P_1** Phenotype: White-eyed male x red-eyed female✓

Genotype: X^rY x X^RX^R ✓

Meiosis

G/gametes X^r , Y X^R , X^R ✓



Fertilisation

F_1 Genotype X^RX^r X^RX^r X^RY X^RY ✓

Phenotype: 2 red-eyed males : 2 red-eyed females
1 red eyed male : 1 red-eyed female✓*

P_1 and F_1 ✓
Meiosis and fertilisation ✓

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

OR

P_1 Phenotype: White-eyed male x Red-eyed female✓
Genotype: X^rY x X^RX^R ✓

Meiosis

Fertilisation

Gametes	X^R	X^R
X^r	X^RX^r	X^RX^r
Y	X^RY	X^RY

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

F_1 Phenotype: 2 red-eyed males: 2 red-eyed females
1 red-eyed male: 1 red-eyed female✓*

P_1 and F_1 ✓
Meiosis and fertilisation ✓

(***1 Compulsory** + Any 5) (6)
(10)
[50]

TOTAL SECTION B: 100
GRAND TOTAL: 150

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