education

Department:
Education
North West Provincial Government
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES P2

SEPTEMBER 2023

MARKING GUIDELINES

MARKS: 150

These marking guidelines consists of 12 pages.

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 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.

SA EXAM PAPERS

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 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 is applicable to all official languages.

19. **Changes to the memorandum**
No changes must be made to the memorandum. The provincial internal moderator must be consulted.

NW/September 2023

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✓   (1)
                (b) Effect of antibiotics✓   (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)

NW/September 2023

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✓
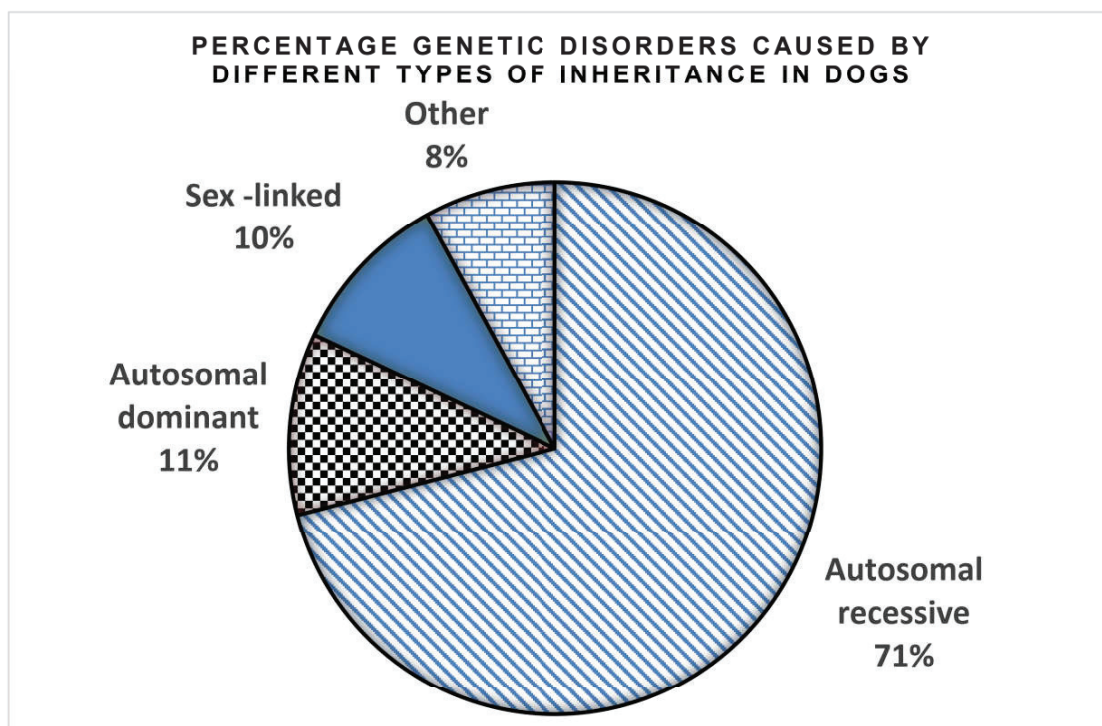**(Mark first ONE only)**   (1)

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°

PERCENTAGE GENETIC DISORDERS CAUSED BY DIFFERENT TYPES OF INHERITANCE IN DOGS

Other 8%

Sex-linked 10%

Autosomal dominant 11%

Autosomal recessive 71%

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	1
All 4 sectors of the graph are drawn and labelled correctly	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]

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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)

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

P₁ Phenotype: White-eyed male x red-eyed female✓

Genotype: XʳY   x   XᴿXᴿ ✓
      Meiosis
G/gametes   Xʳ , Y   Xᴿ , Xᴿ ✓

      Fertilisation

F₁ Genotype   XᴿXʳ   XᴿXʳ   XᴿY   XᴿY ✓

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

P₁ and F₁ ✓
Meiosis and fertilisation ✓
                              (**1 Compulsory** + Any 5)

OR

P₁ Phenotype: White-eyed male x Red-eyed female✓
Genotype: XʳY   x   XᴿXᴿ ✓

Meiosis

Gametes	Xᴿ	Xᴿ
Xʳ	Xᴿ Xʳ	Xᴿ Xʳ
Y	Xᴿ Y	Xᴿ Y

Fertilisation

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

F₁ Phenotype: 2 red-eyed males: 2 red-eyed females
                  1 red-eyed male: 1 red-eyed female✓*

P₁ and F₁ ✓
Meiosis and fertilisation ✓   (6)
                              (**1 Compulsory** + Any 5)   **(10)**
                                                        [50]

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