education

Department of Education
FREE STATE PROVINCE

GRADE 12

LIFE SCIENCES P2

June 2025

TOTAL: 150

TIME: 2 ½ HOURS

This question paper consists of 15 pages.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. Answer ALL the questions.
2. Write ALL the answers in the ANSWER BOOK.
3. Start the answers to EACH question at the top of a NEW page.
4. Number the answers correctly according to the numbering system used in this question paper.
5. Present your answers according to the instructions of each question.
6. Make ALL drawings in pencil and label them in blue or black ink.
7. Draw diagrams, tables or flow charts only when asked to do so.
8. The diagrams in this question paper are NOT necessarily drawn to scale.
9. Do NOT use graph paper.
10. You must use a non-programmable calculator, protractor and a compass, where necessary.
11. Write neatly and legibly.

SECTION A

QUESTION 1

1.1 Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A to D) next to the question number (1.1.1 to 1.1.8) in the ANSWER BOOK, for example 1.1.11 D.

1.1.1 Random arrangement of homologous chromosomes in pairs at the equator of a cell takes place during …

A Prophase 1.
B Metaphase 1.
C Anaphase 2.
D Metaphase2.

1.1.2 The statements below describe the steps in the process of cloning an animal.

(i) The embryo is implanted into the uterus of an adult female for development.
(ii) The nucleus from a somatic cell of the donor is extracted.
(iii) The nucleus from the somatic cell is inserted into the ovum.
(iv) The nucleus from the ovum of another individual is removed.
(v) The ovum with the new nucleus is given an electric shock to stimulate cell division and the formation of the embryo.

The correct sequence of steps for this process is…

A (iv), (v), (i), (ii) and (iii)
B (ii), (iv), (iii), (v) and (i)
C (ii), (iii), (iv), (v) and (i)
D (iv), (iii), (ii), (i) and (v)

1.1.3 Which scientists were credited with first describing the DNA molecule?

A Rosalind Franklin and Maurice Wilkins
B Maurice Wilkins and Francis Crick
C James Watson and Rosalind Franklin
D James Watson and Francis Crick

1.1.4 In ants, females are diploid, and males are haploid. Females and males both produce haploid gametes.
This means that …

A females produce gametes by mitosis.
B males produce gametes by meiosis.
C males produce gametes by mitosis.
D females have half the number of chromosomes that males have.

1.1.5 The table below shows the percentages of nitrogen bases in DNA samples from various organisms.

Source of DNA	Adenine	Cytosine	Guanine	Thymine
Human liver	30	20	20	**Z**
Chicken liver	**W**	40	40	10
Dog liver	24	26	26	24
Mouse bone marrow	23	**X**	27	23
Sunflower leaf	11	39	**Y**	11

Which ROW of the table below correctly reflects the missing data values?

	W	X	Y	Z
A	10	23	38	30
B	10	26	39	31
C	10	27	39	30
D	10	25	38	29

1.1.6 When two heterozygous plants for a characteristic are crossed, the expected genotype ratio is:

A 3:1
B 1:2:1
C 2:1:2
D 1:2

1.1.7 The DNA of different species only differs in the …

A components of the nucleotides.
B sequence of the nucleotides.
C type of bond between the nitrogen bases.
D type of sugar that it contains.

1.1.8 How do codons and anticodons contribute to the process of protein synthesis?

A Codons determine the sequence of amino acids in proteins, while anticodons recognize the codons and bring the correct amino acids to the ribosome.
B Anticodons determine the sequence of amino acids in proteins, while codons recognize the anticodons and bring the correct amino acids to the ribosome.
C Codons and anticodons are only involved in transcription.
D Codons determine the sequence of amino acids in proteins, while anticodons recognize the codons and bring random amino acids to the ribosome.

(8 x2) **(16)**

1.2 Give the correct **biological term** for each of the following descriptions. Write only the term next to the question number (1.2.1 to 1.2.7) in the ANSWER BOOK.

1.2.1 The phase in the cell cycle when DNA replication takes place

1.2.2 An inherited condition where the blood's ability to clot is impaired due to a missing clotting factor

1.2.3 The process where a unique striped pattern is obtained from a person's DNA or sample of bodily fluid

1.2.4 The structure in an animal cell that forms spindle fibers

1.2.5 The type of bond between two nitrogenous bases in a DNA molecule

1.2.6 An organism that has identical alleles for a characteristic

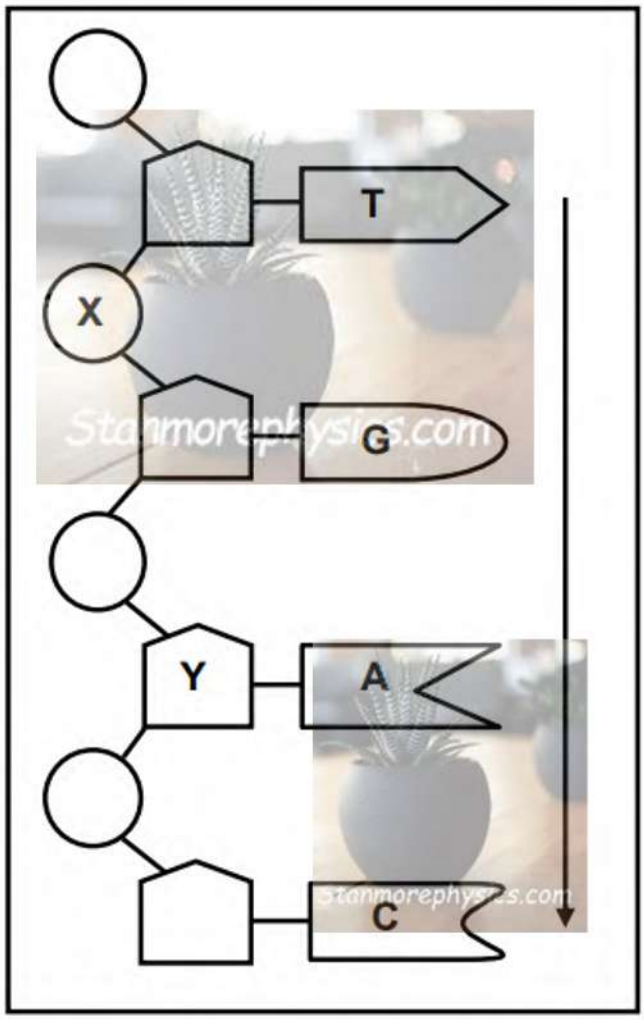
1.2.7 The sugar present in RNA (7x1) **(7)**

1.3 Indicate whether each of the descriptions in COLUMN I applies to **A ONLY**, **B ONLY**, **BOTH A AND B** or **NONE** of the items in COLUMN II. Write **A only**, **B only**, **both A and B** or **none** next to the question number (1.3.1 to 1.3.3) in the ANSWER BOOK.

	COLUMN I	COLUMN II
1.3.1	The origin of mitochondrial DNA in a person	A: Maternal grandmother B: Maternal grandfather
1.3.2	Percentage chance of a child being female	A: 25% B: 75%
1.3.3	When two different alleles in a heterozygous individual result in a phenotype that is different from both homozygous parents.	A: Complete dominance B: Incomplete dominance

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

1.4 The diagram below represents nucleotides in a single strand of a DNA molecule.



1.4.1 Give the LETTER of the part that represents:

(a) A sugar molecule (1)

(b) A phosphate molecule (1)

1.4.2 What is the natural shape of this molecule? (1)

1.4.3 If this strand was to be replicated, write the sequence of nitrogenous bases on the complimentary strand from top to bottom. (2)

1.4.4 State TWO location of DNA, other than the nucleus. (2)

1.4.5 Which nitrogenous base in the diagram would not be present in RNA? (1)

1.4.6 How many *different* nucleotides can be found in a DNA molecule? (1)
(9)

1.5 In mice, the characteristics of hair colour and hair length are controlled by the following alleles:

Hair colour:	**B** black **b** brown	Hair length:	**H** short **h** long

A mouse with black, long hair was crossed with a mouse with brown, long hair. All the F1 offspring had black, long hair.

1.5.1 Name this type of genetic cross? (1)

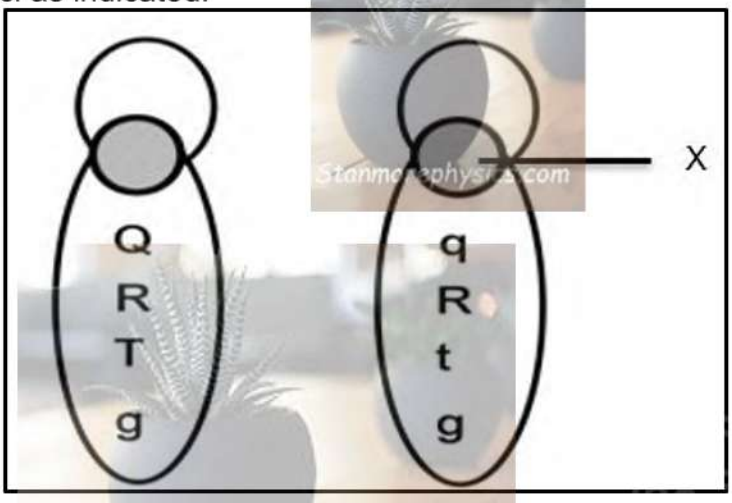
1.5.2 Give the:

(a) Genotype of the parent mouse with black, long hair. (2)

(b) Genotype of all the possible gametes of the parent mouse with brown, long hair. (1)

(c) Phenotype of a mouse with the genotype **bbHh.** (2)
(6)

1.6 The diagram below represents a pair of homologous chromosomes with alleles on specific loci as indicated.



1.6.1 How many genes are represented? (1)

1.6.2 Give the number of characteristics for which this individual is heterozygous. (1)

1.6.3 State TWO features of the chromosomes represented that indicate that they are homologous. (2)

1.6.4 Identify structure **X**. (1)

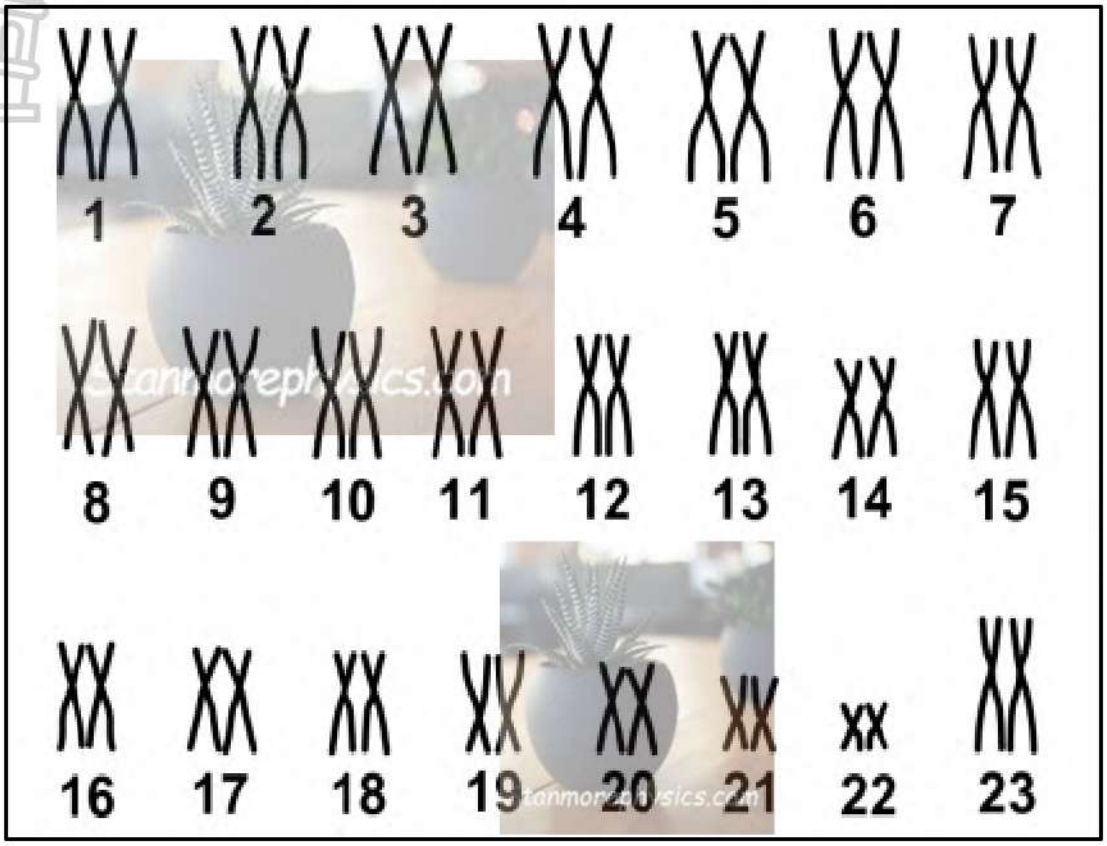
1.6.5 Which type of cell (**diploid cell** or **haploid cell**) contains homologous chromosomes? (1)
(6)

TOTAL SECTION A: (50)

SECTION B

QUESTION 2

2.1 The diagram below represents the karyotype of a human somatic cell.



2.1.1 Describe what a *karyotype* is? (2)

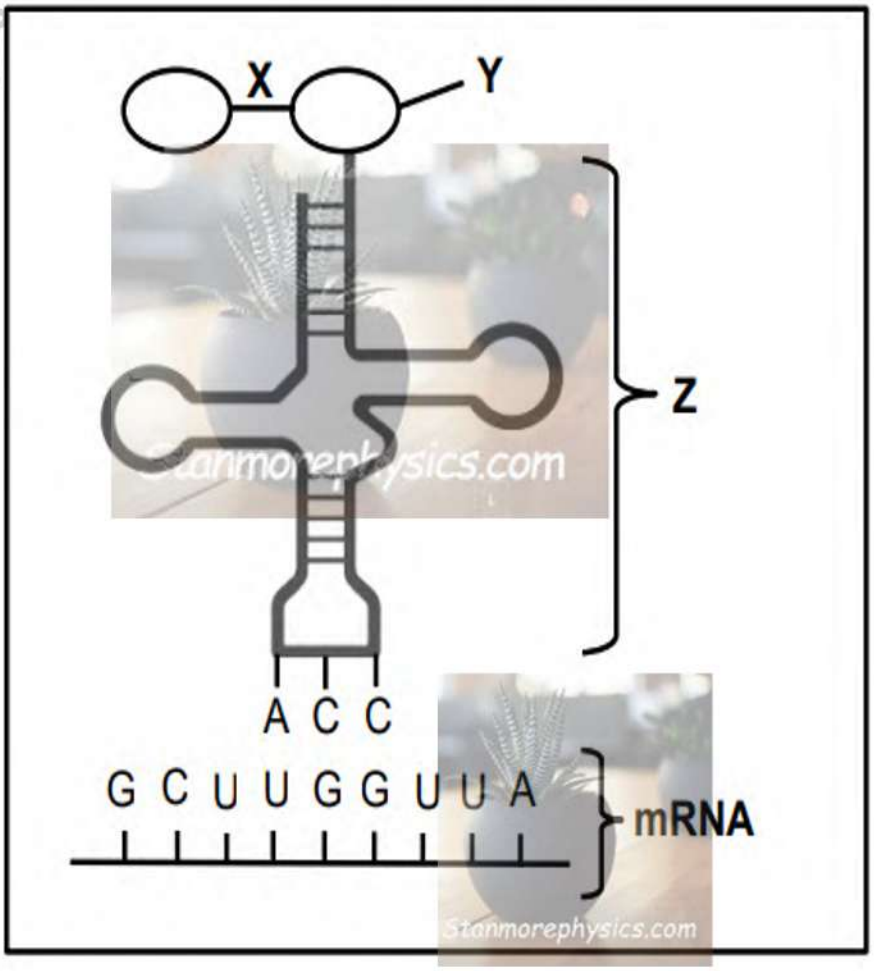
2.1.2 State the collective name for chromosome pair **1** to **22**. (1)

2.1.3 State the phenotype of chromosome pair **23**? (2)

2.1.4 Describe how the karyotype of a person with Down syndrome would differ from the one represented in the diagram. (2)
(7)

2.2 State Mendel's principle of segregation. **(3)**

2.3 The diagram below represents part of a process that occurs during protein synthesis.



2.3.1 Name the process shown in the diagram. (1)

2.3.2 Name the organelle where this proses take place? (1)

2.3.3 Identify:

(a) Bond **X** (1)

(b) Molecule **Z** (1)

2.3.4 How many codons make up the portion of the mRNA molecule? (1)

2.3.5 The table below shows amino acids coded for by different mRNA codons.

mRNA CODON	AMINO ACID
GCU	Alanine
UUA	Leucine
UGG	Tryptophan
UAC	Tyrosine
UUG	Leucine

Use the information in the diagram and in the table to identify:

(a) The amino acid at **Y** (1)

(b) The DNA base triplet that coded for **Y** (2)

(c) How many codons code for Leucine, according to the table? (1)

2.3.6 A mutation caused a DNA base triplet to change from **AAT** to **AAC**. Describe the effect of this mutation on the protein formed. (5)
(14)

2.4 Describe the process of transcription in protein synthesis. **(6)**

2.5 Cheetahs are big cats found in the dry grasslands and woodlands of Southern Africa. Cheetahs normally have spotted fur markings. However, the King Cheetah is a rare variety with striped fur markings. The rarity of the King cheetah is due to a genetic mutation that affects the production of Melanin, resulting in a unique and distinctive coat pattern. The letters **N** and **n** represent the alleles for the different fur markings.

The table shows the results of genetic crosses between two different breeding pairs of cheetahs.

Cross	**Phenotype for fur pattern**	
	Parents	**Offspring**
Breeding pair 1	spotted fur x spotted fur	3 with spotted fur 1 with striped fur
Breeding pair 2	spotted fur x striped fur	2 with spotted fur 2 with striped fur

2.5.1 Which phenotype is recessive? (1)

2.5.2 Explain your answer for QUESTION 2.5.1 using the results in the table (3)

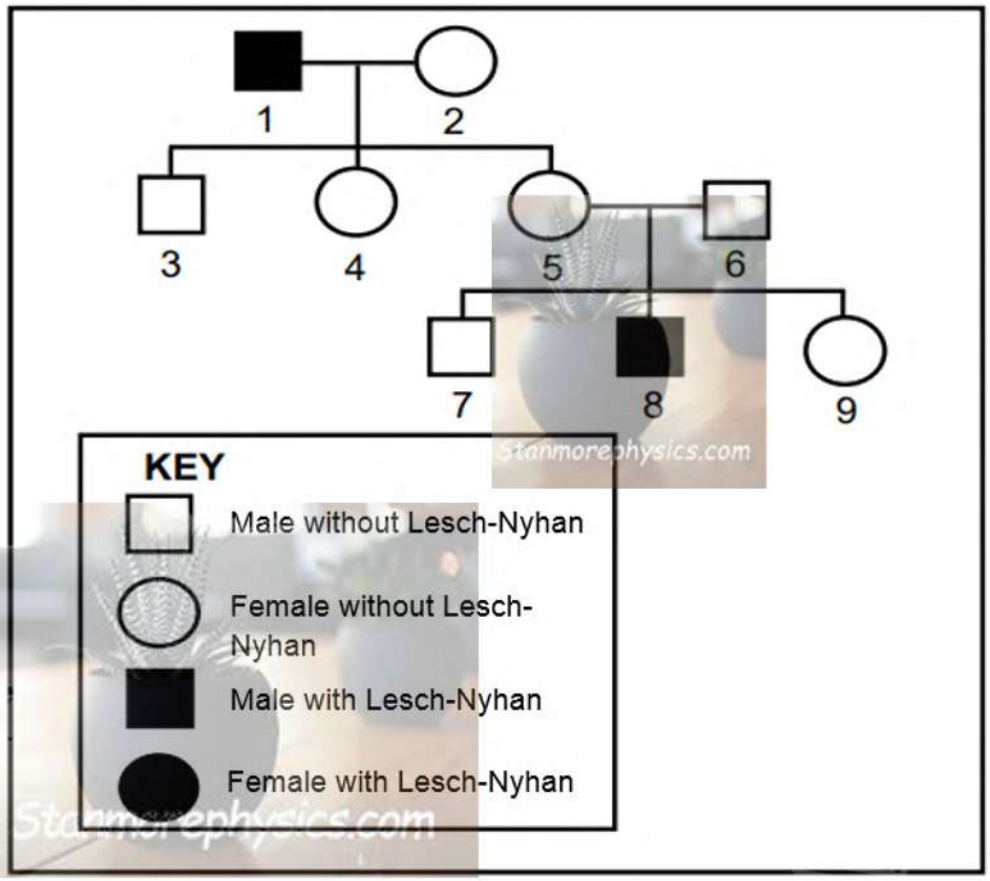
2.5.3 Define the term *gene mutation*. (2)

2.5.4 Name the law of Mendel demonstrated by the phenotype of the offspring? (1)

2.5.5 Use the letters **N** and **n**, do a genetic cross to show the phenotype ratio of the offspring produced when two heterozygous spotted fur cheetahs are crossed. (6)
(13)

2.6 Lesch-Nyhan syndrome is inherited as a sex-linked recessive ($\mathbf{X^r}$) genetic disorder that, with rare female exceptions, most often affects males. The symptoms of Lesch-Nyhan syndrome include decreased kidney function, acute gouty arthritis and self-mutilating behaviours such as lip and finger biting and/or head banging.

The pedigree diagram below shows the inheritance of Lesch-Nyhan syndrome in a family.



2.6.1 How many males in this family suffer from Lesch-Nyhan syndrome? (1)

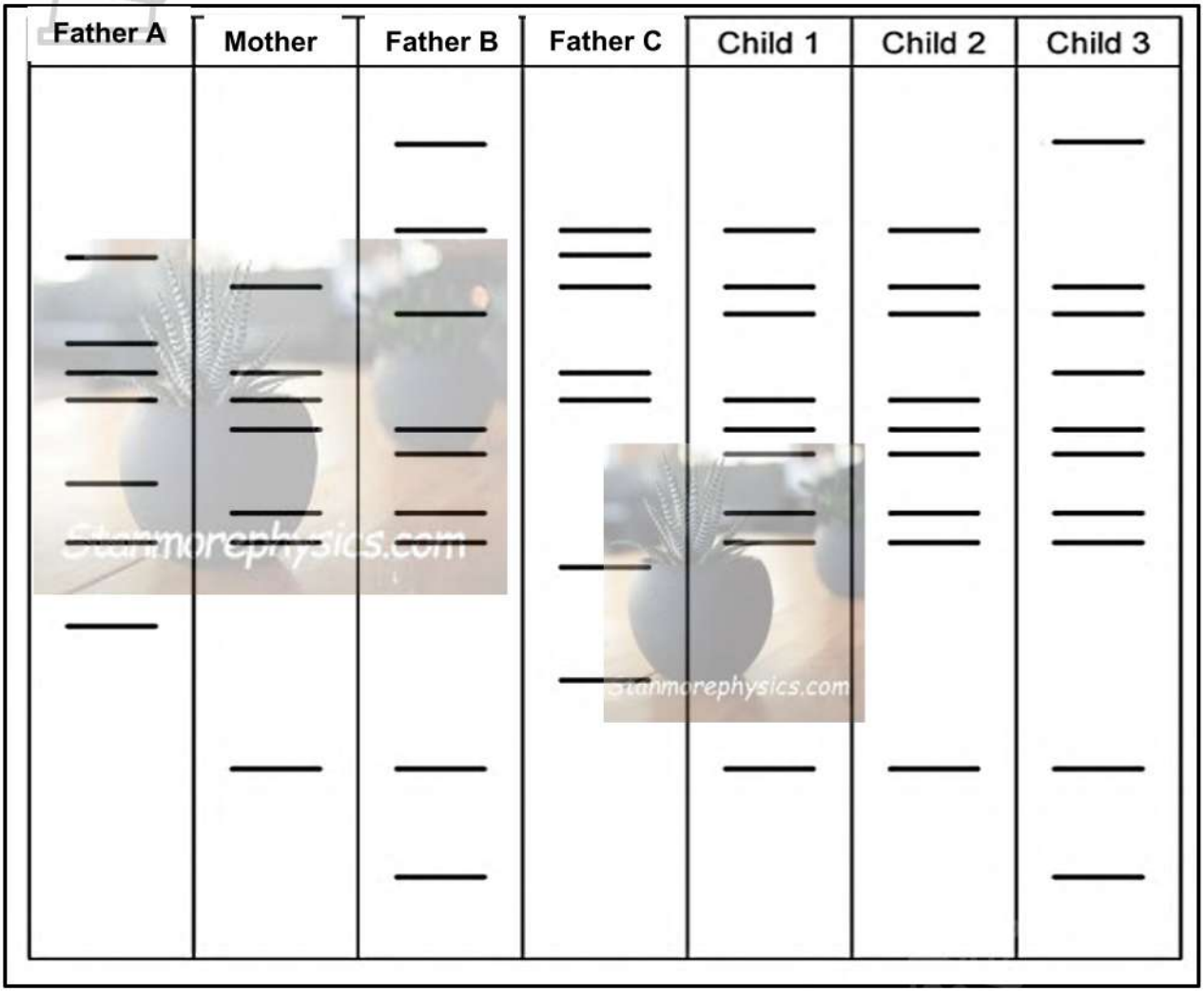
2.6.2 State ALL the possible genotypes of individual 5. (2)

2.6.3 Explain why males are more likely to suffer from Lesch-Nyhan syndrome than females. (4)
(7)

TOTAL QUESTION 2: [50]

QUESTION 3

3.1 The diagram below represents the results of a paternity investigation. It was determined that the three children were siblings (brothers or sisters) and share the same biological mother. Letters **A**, **B** and **C** represent the DNA profile of possible fathers.



3.1.1 Identify the children's father? (1)

3.1.2 Give a reason for your answer to QUESTION 3.1.1. (2)

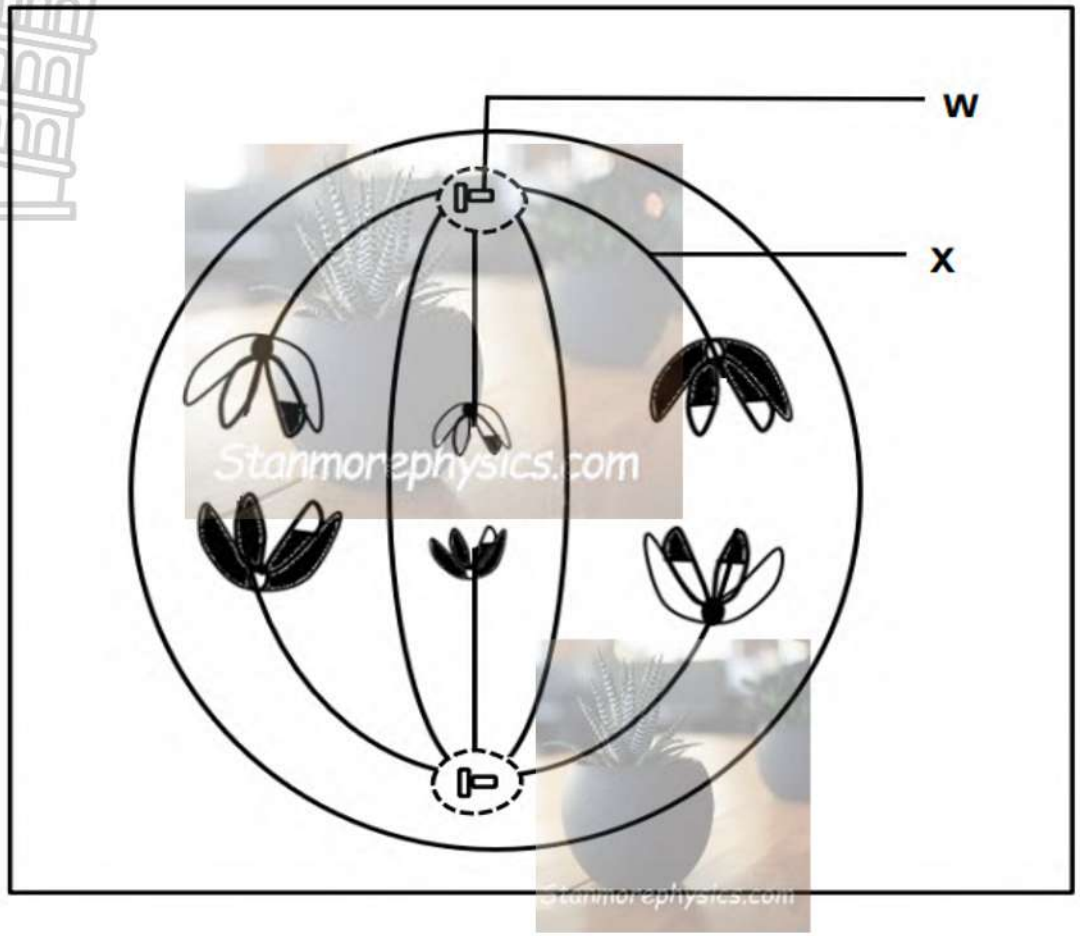
3.1.3 Which of the children are identical twins? (2)

3.1.4 Explain why blood tests are not as accurate in determining paternity as DNA profiling. (3)

3.1.5 State TWO other uses of DNA profiling. (2)

3.1.6 Describe ONE precaution when working with DNA samples in the laboratory to ensure accurate results. (2)
(12)

3.2 The diagram below represents a phase during meiosis.



3.2.1 Identify the phase of meiosis shown. (1)

3.2.2 Give ONE reason for your answer in QUESTION 3.2.1 (1)

3.2.3 Identify the structures:

(a) **W** (1)

(b) **X** (1)

3.2.4 State the number of chromosomes that each gamete will contain at the end of meiosis. (1)
(5)

3.3 Tabulate THREE differences between mitosis and meiosis. **(7)**

3.4 A scientist wanted to investigate the effect of temperature on the frequency of meiotic recombination in barley plants.

He expects that an increase in temperature will lead to an increase in meiotic recombination in barley plants.

The procedure was as follows:

- Prepared three growth chambers with temperatures of 15°C, 20°C and 25°C
- Planted the same variety of 10 barley seeds in each chamber and the plants were given the same amount of water and same amount of sunlight.
- Collected the samples after 6 weeks from each chamber.
- Stained and examined the samples, by using a precise method under a microscope to count the number of chiasmata per cell.
- Record and analyze the data.

3.4.1 Give a scientific question for this investigation. (2)

3.4.2 Identify the:

(a) Independent variable (1)

(b) Dependant variable (1)

3.4.3 State THREE ways in which the validity of this investigation was ensured. (3)

3.4.4 What happens at the chiasmata in meiosis? (1)

3.4.5 What is the biological importance of meiosis in the life cycle of a plant such as barley? (2)
(10)

3.5 Researchers may obtain human stem cells from embryos or adult sources. Adult stem cells can help to replace and repair damaged cells after an injury or infection but have limited differentiative potential and embryonic stem cells have the ability to differentiate into any cell type.
Some diseases and disorders that can be treated with stem cells include Leukaemia and Parkinson's disease.

3.5.1 Define the term *stem cells*? (2)

3.5.2 What type of cell division do stem cells undergo to produce tissues? (1)

3.5.3 From the passage, give TWO reasons for the use of stem cells. (2)

3.5.4 Give ONE source where adult stem cells can be collected from. (1)
(6)

3.6 Humans have four blood groups **A**, **B**, **AB** and **O**. Blood groups are determined by the alleles inherited from parents.

3.6.1 Explain how the four blood groups in humans can result from a single gene. (6)

3.6.2 Explain how it is possible for a mother with blood group **A** and a father with blood group **B** to have a child with blood group **O.** (4) **(10)**

TOTAL QUESTION 3: [50]

TOTAL SECTION B: 100

GRAND TOTAL: 150

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GRADE 12

LIFE SCIENCES P2

JUNE 2025

TOTAL: 150

MARKING GUIDELINES

These marking guidelines consist of 10 pages.

PRINCIPLES RELATED TO MARKING LIFE SCIENCES

1. **If more information than marks allocated is given**
   Stop marking when maximum marks is 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 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 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 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 but only the 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 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.

SECTION A

QUESTION 1

1.1	1.1.1	B ✓✓		
	1.1.2	B ✓✓		
	1.1.3	D ✓✓		
	1.1.4	C ✓✓		
	1.1.5	C ✓✓		
	1.1.6	B ✓✓		
	1.1.7	B ✓✓		
	1.1.8	A ✓✓	(8x2)	**(16)**
1.2	1.2.1	Interphase ✓		
	1.2.2	Haemophilia✓		
	1.2.3	DNA profiling✓		
	1.2.4	Centriole / Centrosome✓		
	1.2.5	(Weak) hydrogen bonds✓		
	1.2.6	Homozygous✓		
	1.2.7	Ribose✓	(1x7)	**(7)**
1.3	1.3.1	A only✓✓		
	1.3.2	None✓✓		
	1.3.3	B only✓✓	(3 x 2)	**(6)**
1.4	1.4.1	a) Y✓		(1)
		b) X✓		(1)
	1.4.2	Double helix✓		(1)
	1.4.3	A C T G(✓✓)		(2)
	1.4.4	Mitochondria✓ Chloroplast✓		(2)
	1.4.5	Thymine✓ /(T)		(1)
	1.4.6	Four✓/4		(1) **(9)**

1.5 1.5.1 Dihybrid (crossing) ✓ (1)

1.5.2 (a) BBhh✓✓ (2)
(b) bh✓/ bh bh bh bh (1)
(c) Brown hair colour and short hair✓✓ (2)
(6)

1.6 1.6.1 4 / Four✓ (1)

1.6.2 2/ Two✓ (1)

1.6.3
- They are the same/ similar size/length. ✓
- They have the same/ similar shape. ✓
- They have genes for the same characteristics. ✓
- They have alleles of a specific gene on the same locus. ✓
- They have centromeres in the same position. ✓ (2)

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

(1)

1.6.4 Centromere✓

(1)

1.6.5 Diploid cell✓ **(6)**

TOTAL SECTION A: (50)

QUESTION 2

2.1.1 -It is the arrangement of the (complete set of an individual's) chromosomes✓
-According to the number and shape✓ of the chromosomes. (2)

2.1.2 Autosomes ✓ (1)

2.1.3 Female✓✓ (2)

2.1.4 - 3 chromosomes✓ / an extra chromosome
- at position number 21 ✓ (2)
(7)

2.2 - The factors/alleles that control a characteristic separate ✓
- during meiosis ✓
- so that only one factor/allele is present in each gamete ✓ **(3)**

2.3.1 Translation✓ (1)

2.3.2 Ribosome✓ (1)

2.3.3 a) Peptide Bond✓ (1)
b) tRNA✓ / transfer RNA (1)

2.3.4 3✓/three (1)

2.3.5 a) Tryptophan✓ (1)

b) ACC✓✓ (2)

c) 2✓ (1)

2.3.6
- The codon on the mRNA✓
- will change from UUA to UUG✓
- The anticodon on the tRNA will bring the same amino acid ✓/ Leucine to the ribosome
- The sequence of the amino acids would not change ✓
- Therefore, there will be no effect on the protein formed✓/ same protein will form (5)

(14)

2.4
- The DNA double helix unwinds✓ and
- (the double strand) 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 ✓/A compliments U,G compliments C

Any 6 **(6)**

2.5.1 Striped fur✓ (1)

2.5.2 - In Breeding pair 1✓
- both parents are spotted fur✓/none of the parents are striped fur
- but striped fur appears in the phenotype of the offspring✓

OR

- In cross 1✓
-The ratio spotted fur to stripe fur is 3:1✓
-The smaller portion represents the recessive alle striped fur ✓ (3)

2.5.3 A gene mutation is a **change in the sequence of nucleotides** in a gene/ DNA✓✓ (2)

2.5.4 Law of dominance✓ (1)

2.5.5 P1 Phenotype : Spotted fur x Spotted fur✓
Genotype Nn x Nn ✓

Meiosis
G/gametes N, n x N, n✓

Fertilization

F1 Genotype NN, Nn, Nn, nn ✓

Phenotype ratio: 3 Spotted : 1 striped *✓

P1 and F1✓
Meiosis and fertilization✓ ***Compulsory 1** + Any 5

OR

P_1 Phenotype Spotted fur x Spotted fur ✓

Genotype Nn x Nn ✓

Meiosis

G/gametes N, n x N, n ✓

Fertilisation

Gametes	N	n
N	NN	Nn
n	Nn	nn

1 Mark for correct gametes
1 Mark for correct genotypes

F_1 Genotype NN, Nn, Nn, nn

Phenotype 3 Spotted fur: 1 Striped fur ✓*

P_1 and F_1 ✓
Meiosis and fertilisation ✓ ***Compulsory 1** + Any 5

(6)
(13)

2.6.1 2✓ (1)

2.6.2 5 - X^RX^r✓✓ (2)

2.6.3 - Males have only one X chromosome✓/ XY sex chromosomes
- If this chromosome carries the recessive allele✓/ (X^r)
- the male will suffer from Lesch-Nyhan syndrome ✓
- Females have two X chromosomes✓/XX and
- will only suffer from Lesch-Nyhan syndrome when they carry two recessive alleles on both X chromosomes✓/($X^r X^r$)
- A dominant allele on one of the X-chromosomes will mask the effect✓

Any 4 (4)
(7)

Total Queston 2 [50]

QUESTION 3

3.1.1 Father **B** ✓ (1)

3.1.2 - All the DNA profile bars/bands of the children that do not match the mother✓, match the DNA profile bars/bands of Father B✓

OR

- All DNA profile bands of the mother and Father B✓
- match all the children's DNA profile bands✓ (2)

3.1.3 Child 1 and 2✓✓ (2)

3.1.4 - Blood groups cannot identify with certainty who is the father ✓/ blood groups can only eliminate men who are not the father

- Because many males have the same blood group. ✓

- Each person's DNA profile is unique. ✓ (3)

3.1.5 - To identify organisms/dead people from their remains✓
- To test for the presence of specific alleles✓for genetic conditions/Identification of genetic disorders
- To establish matching tissues for organ transplants✓
- Identification of suspects in a crime ✓
- Tracing missing persons ✓
- **(Mark first two only)** **Any 2** (2)

3.1.6
- Mark the samples clearly✓to ensure that the samples are not mixed up✓
- Wear a mask and gloves✓,DNA must not get contaminated✓
- Use new and clean/sterilized apparatus✓ to ensure no contamination from previous tests. ✓
- Check the access of persons/Only authorized persons may have access✓so that no one can tamper with the samples.

(Mark first ONE 0nly) **(Any 1 x 2)** (2)
(12)

3.2.1 Anaphase **1** (1)

3.2.2 - Chromosome of (homologous pair) is being pulled to the opposite poles ✓ (1)

3.2.3 a) Centriole✓ (1)
b) Spindle fiber✓ (1)

3.2.4 3✓/three (1)
(5)

3.3

Mitosis	Meiosis
Mitosis occurs in body cells✓	Meiosis occurs in sex cells✓
Both karyokinesis and cytokinesis occurs once.✓	Both karyokinesis and cytokinesis occurs twice.✓
Two daughter cells are formed.✓	Four daughter cell are formed.✓
Daughter cells are genetically identical to one another and to the parent cell✓	Daughter cells are genetically different from each other and from the parent cell✓
Chromosome number remains constant✓	Chromosome number is halved✓
Crossing over does not occur✓	Crossing over occurs✓

(7)
(Mark first THREE only) **(Any 3 X 2)** **✓ for TABLE**

3.4.1 What is the effect of temperature on the frequency of meiotic recombination in barley plants?✓✓ (2)

3.4.2 a) Temperature✓ (1)
b) Frequency of meiotic recombination✓ (1)

3.4.3 - Same amount of water✓
- Same light intensity✓
- Same barley plant variety✓
- Same precise method of counting ✓

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

3.4.4 - Genetic material is exchanged.✓ (1)

3.4.5 -The production of haploid gametes✓
- It maintains a constant chromosome number from one generation to the next.✓
- It increases genetic variation ✓ **(any 2)** (2)

(Mark first TWO only) **(10)**

3.5.1 Undifferentiated cells that can develop into any other type of cell✓✓ (2)

3.5.2 Mitosis✓ (1)

3.5.3 -It can help to replace and repair damaged cells ✓after an injury or infection
- Embryonic stem cells can differentiate into any cell type✓
- Some diseases and disorders can also be treated. ✓/ Leukemia and Parkinsons can be treated

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

3.5.4 Bone marrow✓/blood/heart/adipose tissue/brain/

(Mark first ONE only) **(Any 1)** (1)

(6)

3.6.1 - Blood groups/the gene for blood groups is controlled by three alleles✓/ I^A, I^B, i
- Each person can only inherit two alleles✓/One allele from each parent ✓
- The I^A and I^B allele are dominant ✓
- over the i allele ✓
- The combination I^Ai and I^AI^A produce blood group A✓
- The combination I^Bi and I^BI^B produces blood group B✓
- The combination I^AI^B produces blood group AB✓
- The combination ii produces blood group O✓ (6)

3.6.2
- The Mother is heterozygous for blood group A✓ / I^Ai
- Ther father is heterozygous for blood group B✓/ I^Bi
- The child is homozygous for blood group O✓ /ii
- And receive the recessive allele✓/i form each parent (4)

(10)

[50]

TOTAL SECTION B: 100
GRAND TOTAL: 150

