



education

Department:
Education
North West Provincial Government
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES P2

SEPTEMBER 2024

MARKS: 150

TIME: 2½ hours



This question paper consists of 16 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 answer 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. Do 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 all drawn to scale.
9. Do NOT use graph paper.
10. You must use a non-programmable calculator, protractor and compass where necessary.
11. Write neatly and legibly.



SECTION A

QUESTION 1

1.1 Various options are provided as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question numbers (1.1.1 to 1.1.9) in the ANSWER BOOK, e.g 1.1.10 D.

1.1.1 During which phase of meiosis do homologous chromosomes split and move to the poles?

- A Anaphase II
- B Telophase I
- C Anaphase I
- D Prophase I

1.1.2 The list below describes features of evolutionary theories:

- (i) Organisms show a great deal of variation
- (ii) Long periods of time during which species do not change
- (iii) Frequent use of organs results in them becoming stronger, better and bigger
- (iv) Favourable characteristics are passed on to the next generation

Which ONE of the following combinations of features gives the CORRECT characteristics of natural selection?

- A (i) and (iv) only
- B (iii) and (iv) only
- C (ii) and (iii) only
- D (i) and (iii) only

1.1.3 The table below shows the DNA triplets that code for some amino acids.

DNA triplet	Amino acids
ACA	Cysteine
CTT	Glutamic acid
TGT	Threonine
TTA	Asparagine
GAA	Leucine
TAC	Methionine

The anticodon for the amino acid leucine will be ...

- A ACA.
- B CUU.
- C GAA.
- D AGA.

1.1.4 In humans, brown eye colour is dominant over blue eye colour.

When one parent has blue eyes and the other parent has brown eyes and both are homozygous for the trait, what are the chances that their children will have blue eyes?

- A 100%
- B 75%
- C 50%
- D 0%

1.1.5 Which ONE of the following monohybrid crosses will result in a phenotypic ratio of 1 : 1?

- A Both parents are homozygous for the dominant characteristic.
- B Both parents are homozygous.
- C One parent is heterozygous and the other parent is homozygous dominant.
- D One parent is heterozygous and the other parent is homozygous recessive.

1.1.6 The characteristics that appear in both humans and African apes are ...

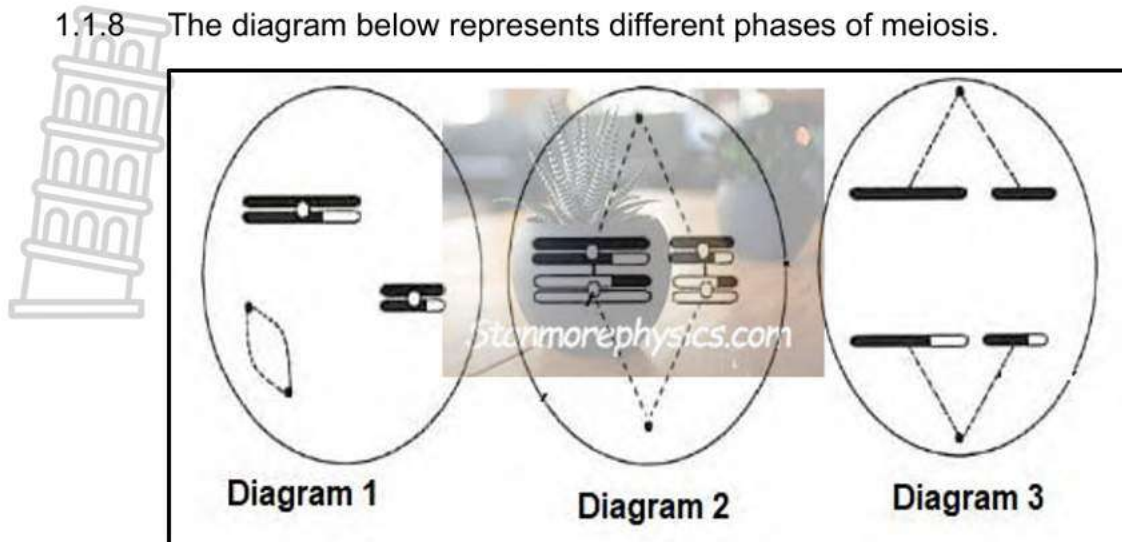
- A opposable thumb, sexual dimorphism and bipedalism.
- B opposable thumb, sexual dimorphism and quadrupedalism.
- C large cranium, small canines and prognathous jaw.
- D small cranium, large canines and prognathous jaw.

1.1.7 The first primate to use tools constantly was ...

- A *Homo neanderthalensis*.
- B *Homo sapiens*.
- C *Homo floresiensis*.
- D *Homo habilis*.



1.1.8 The diagram below represents different phases of meiosis.



The sequence in which the phases of meiosis occur are diagrams ...

- A 1, 3 and 2.
- B 3, 1 and 2.
- C 2, 1 and 3.
- D 1, 2 and 3.

1.1.9 A sample of DNA has 80 guanine bases and 40 adenine bases.

How many phosphate molecules would you expect in ONE strand of this sample of DNA?

- A 40
- B 60
- C 120
- D 240

(9 x 2) (18)



- 1.2 Give the correct **biological term** for each of the following descriptions. Write only the term next to the question numbers (1.2.1 to 1.2.9) in the ANSWER BOOK.
- 1.2.1 The type of vision present in both apes and humans that allows for depth perception
- 1.2.2 The monomers of nucleic acids
- 1.2.3 An explanation describing evolution as consisting of long phases of little change alternating with short phases of rapid change
- 1.2.4 The phase in the cell cycle during which DNA replication occurs
- 1.2.5 The type of variation in a population in which there is no range of intermediate phenotype
- 1.2.6 A sub-group of the hominids that includes only modern humans and early human ancestors
- 1.2.7 Undifferentiated cells that can develop into any type of cell, tissue or organ
- 1.2.8 The characteristics that are influenced by alleles carried on the gonosomes
- 1.2.9 The biotechnological production of genetically identical offspring (9 x 1) (9)

- 1.3 Indicate whether each of the statements in COLUMN I apply 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 numbers (1.3.1 to 1.3.3) in the ANSWER BOOK.

COLUMN I	COLUMN II
1.3.1 The genotype of a male with colour blindness	A: X^dY B: X^dX^d
1.3.2 Evidence of evolution	A: Modification by descent B: Fossil record
1.3.3 Discovered the structure of the DNA molecule	A: Raymond Dart B: Watson and Crick

(3 x 2) (6)

1.4 The diagram below shows the DNA profiles of a girl, her mother and four males.



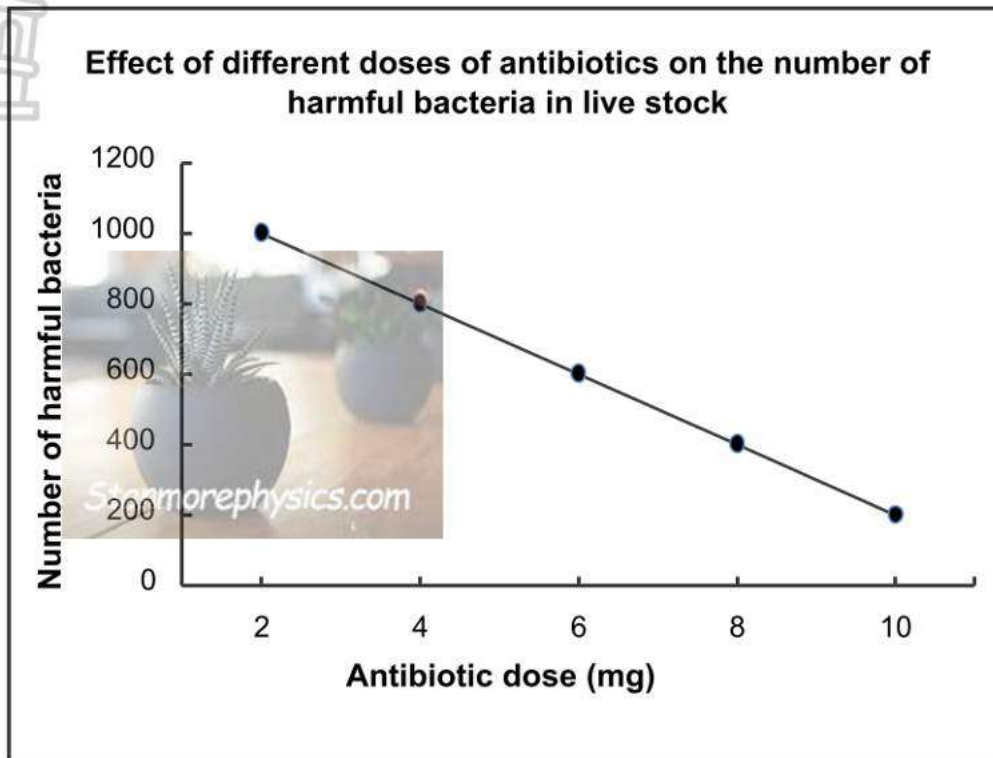
Girl	Mother	Males			
		1	2	3	4

- 1.4.1 Which male is the girl's biological father? (1)
 - 1.4.2 Explain your answer in QUESTION 1.4.1. (2)
 - 1.4.3 State TWO other functions of DNA profiling. (2)
- (5)**



- 1.5 Some farmers add low doses of antibiotics to the cattle feed which could result in the evolution of antibiotic resistant bacteria.

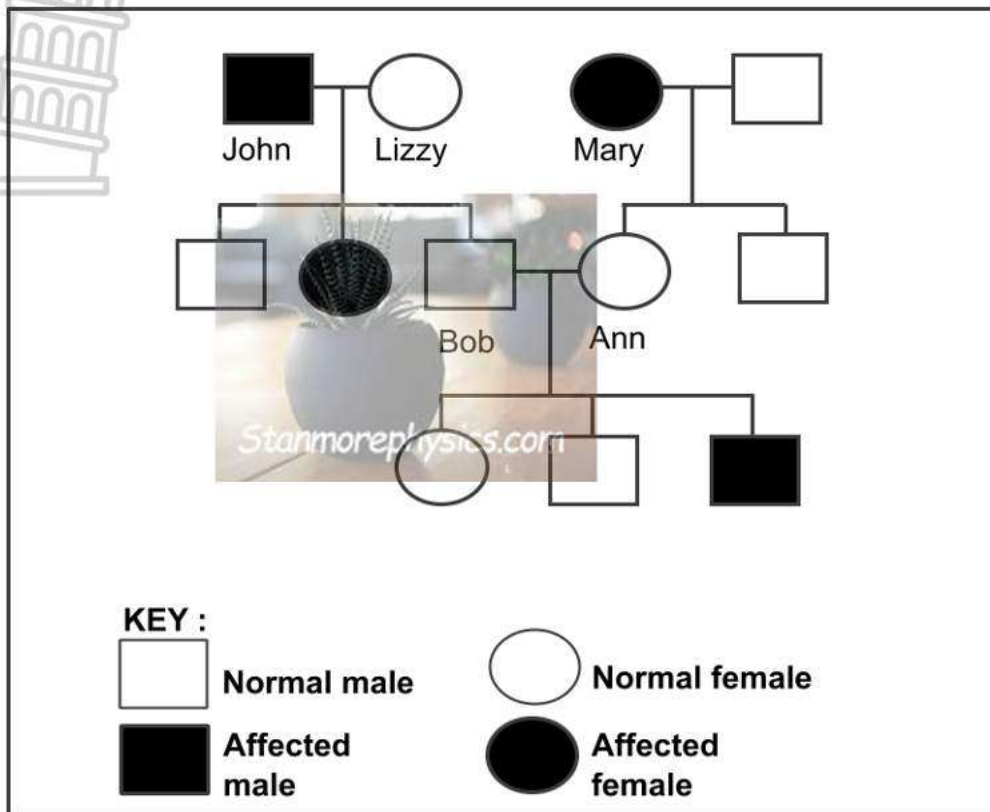
The graph below shows the effect of different doses of antibiotics on the number of harmful bacteria.



- 1.5.1 Name the type of evolution that could result in the evolution of antibiotic resistant bacteria. (1)
- 1.5.2 Identify the:
- (a) Independent variable (1)
 - (b) Dependent variable (1)
- 1.5.3 Describe the trend observed in the graph. (2)
- 1.5.4 Use evidence from the graph above to explain why higher doses of antibiotics will benefit the farmer economically. (2)
- (7)

1.6 Albinism is caused by an autosomal recessive allele (**a**).

The diagram below shows the inheritance of the albinism in a family.



1.6.1 Give:

- (a) Mary's phenotype (1)
- (b) Lizzy's genotype (1)
- (c) John's genotype (1)

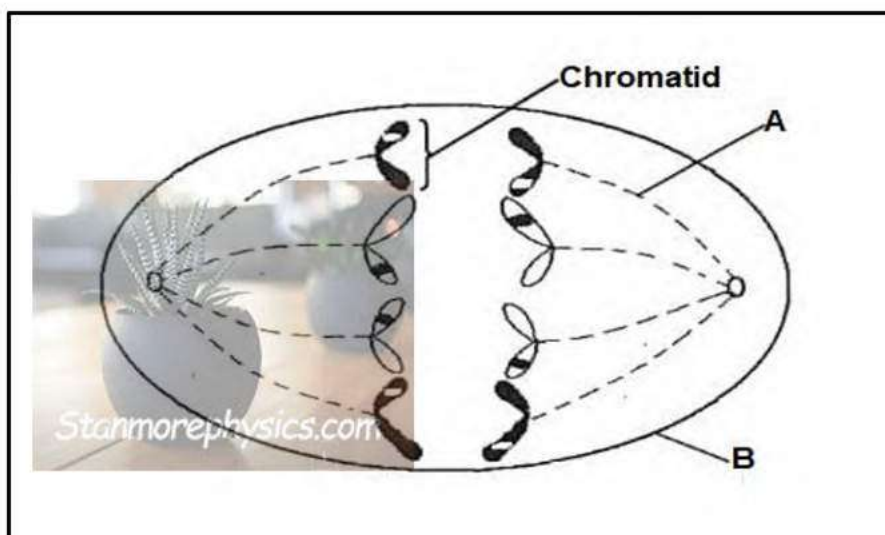
1.6.2 Explain why Bob and Ann are both heterozygous for albinism. (2)
(5)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 The diagram below represents an animal cell in a phase of meiosis.



2.1.1 Name structure:

(a) **A** (1)

(b) **B** (1)

2.1.2 Identify the phase represented in the diagram above. (1)

2.1.3 Give a reason for your answer to QUESTION 2.1.2. (2)

2.1.4 Which phase occurred before to the one represented in diagram? (1)

2.1.5 Explain the consequences if the process, causing variation, did not occur between chromatids from the cell above. (3)

2.1.6 How many cells will be formed at the end of this cell division? (1)

2.1.7 Tabulate TWO differences between Meiosis I and Meiosis II (5)
(15)

2.2 Lamarck's theory of evolution is based on TWO Laws or Principles.

The **Law of use and disuse** and the **Law of inheritance of acquired characteristics**

2.2.1 Explain the Law of inheritance of acquired characteristics according to Lamarckism. (2)

2.2.2 Explain why Lamarck's ideas are NOT accepted in the science community today. (2)

(4)

2.3 There are four blood groups in humans.

Blood group A, B, AB and O are regarded as phenotypes.

2.3.1 Explain why blood groups are controlled by multiple alleles. (2)

2.3.2 How many of these alleles can an individual inherit in the genotype? (1)

2.3.3 Explain the role of blood grouping in paternity testing. (2)
(5)

2.4 Scientists wanted to determine what type of genetic disorder are found mostly in cats.

To do this they took 200 cats of the same breed suffering from various genetic disorders.

The table below represent the types of genetic disorders and percentage of each:

Type of genetic disorders	Percentage of genetic disorders
Diabetes	45
Polycystic Kidney Disease	25
Deafness	20
Other	10

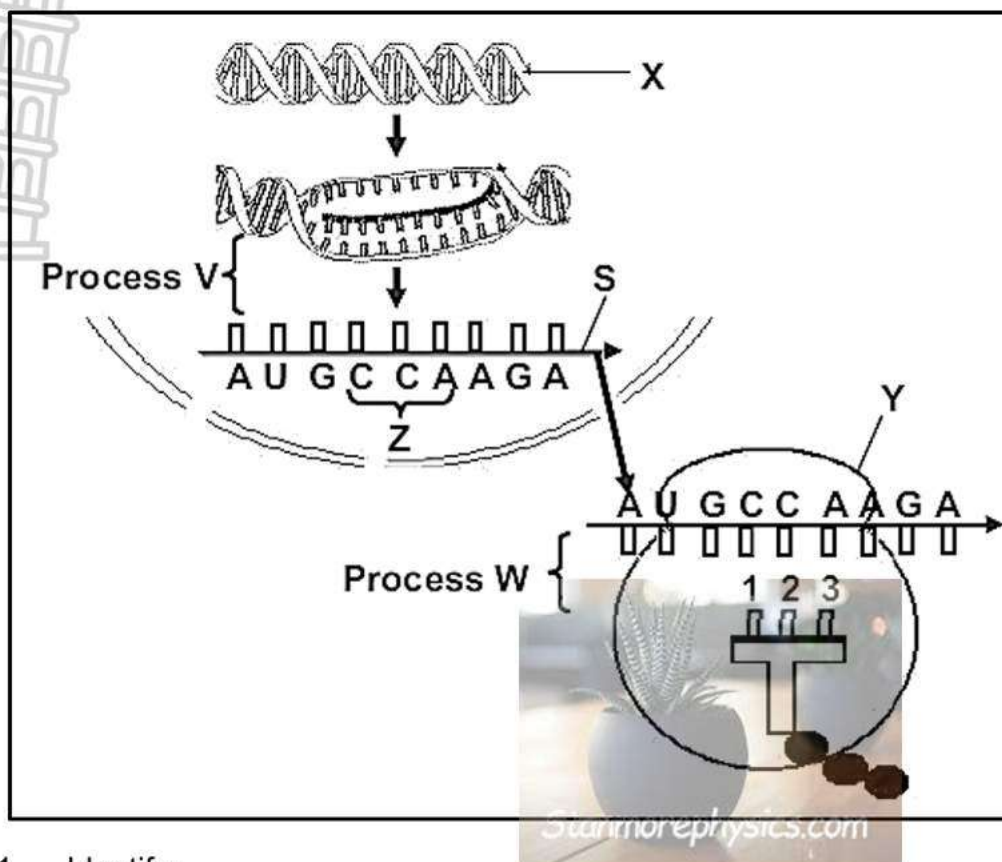
2.4.1 Explain the concept *gene mutation*. (2)

2.4.2 State ONE way in which the reliability of the investigation was achieved. (1)

2.4.3 Draw a pie chart to represent the data in the table above. (6)
(9)



2.5 The diagram below shows the process of protein synthesis.



2.5.1 Identify:

- (a) Process V (1)
- (b) Two places where molecule X is found (2)
- (c) Nitrogenous base A (1)

2.5.2 Describe the process occurring at Y. (6)

2.5.3 Give the anticodon for the nitrogenous bases labelled Z. (1)

2.5.4 If the 3rd base on the molecule S changed to C, explain the consequences to the protein that will be formed. (3)

2.5.5 The table below shows the amino acids that correspond to different DNA codes.

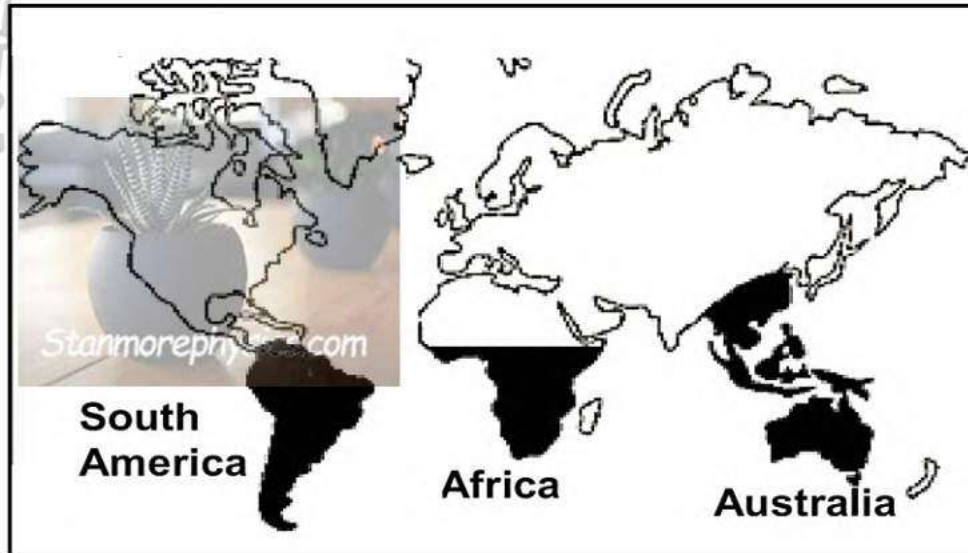
Amino acid	DNA code
Glycine	GGT
Arginine	TCT
Methionine	TAC

Write down the sequence from left to right of amino acids coded by molecule S.

(3)
 (17)
 [50]

QUESTION 3

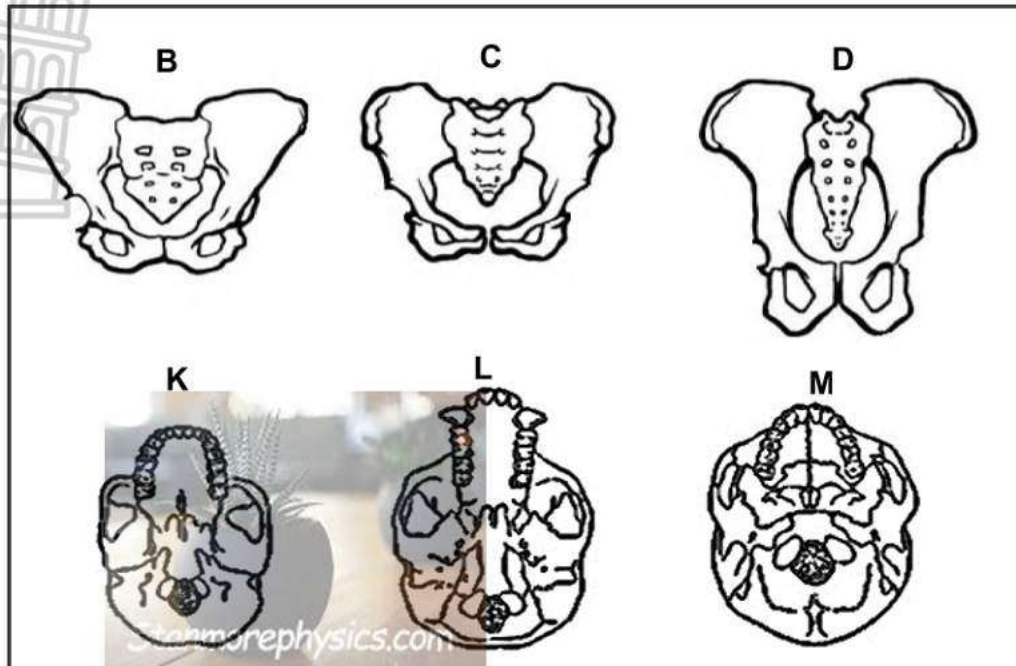
- 3.1 Shrubs of the family Proteaceae can be found in Australia, South America and parts of Africa as shown on the map below.



- 3.1.1 Define the term *species*. (3)
- 3.1.2 Explain how the different species of shrubs could have evolved in South America, Africa and Australia. (7)
- 3.1.3 Mention TWO reproductive isolation mechanisms that keep species separated. (2)
- (12)**



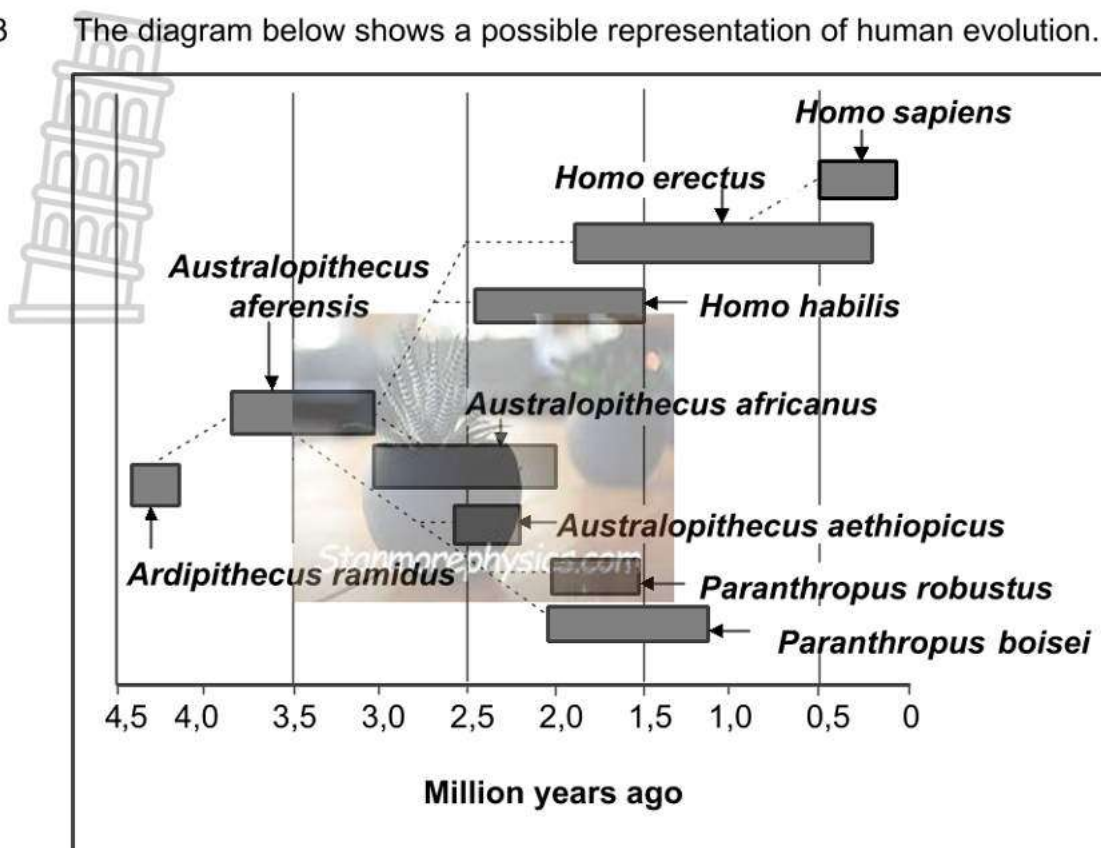
3.2 The diagrams below represent the pelvic structure and the ventral view of the skulls of three organisms.



- 3.2.1 Write down the LETTER of the skull that shows a foramen magnum of *H. sapiens*. (1)
- 3.2.2 Explain your answer to QUESTION 3.2.1. (2)
- 3.2.3 Describe how pelvis **D** is representative of a quadrupedal organism. (2)
- 3.2.4 Describe TWO visible differences between the jaws of skull **K** and **L**. (4)
- (9)**



3.3 The diagram below shows a possible representation of human evolution.



- 3.3.1 Name the type of diagram shown above. (1)
 - 3.3.2 How long ago did *Australopithecus afarensis* become extinct? (1)
 - 3.3.3 Identify TWO species that coexisted with *Homo erectus*. (2)
 - 3.3.4 State ONE advantage of a larger cranial capacity in *H. sapiens*. (2)
 - 3.3.5 Calculate the time difference between the evolution of *Homo erectus* and *Homo sapiens*. (2)
 - 3.3.6 Describe how the fossils of the species in the diagram provide evidence for the Out of Africa hypothesis. (2)
- (10)**



- 3.4 In rabbits, brown fur (**B**) is dominant to white fur (**b**) and long ears (**E**) are dominant to short ears (**e**).

A rabbit that is heterozygous for both characteristics is crossed with a rabbit with white fur and short ears.

3.4.1 How many genes of the rabbits are considered in this cross? (1)

3.4.2 State the genotypes of the parents. (2)

3.4.3 Give:

(a) Phenotype of rabbit that is dominant for both characteristics (2)

(b) All the possible genotypes in the gametes of the heterozygous parent (2)

3.4.4 State Mendel's Law of independent assortment. (2)

(9)

- 3.5 Read the information below

Familial hypercholesterolemia, a disorder that is passed down through families, causes LDL (bad) cholesterol level to be very high. This disorder shows incomplete dominance.

Allele H^N codes for normal LDL receptor. Allele H^S codes for the inability to make a LDL receptor. Individuals with genotype $H^N H^N$ are normal and those with genotype $H^S H^S$ have severe hypercholesterolemia. Heterozygous ($H^N H^S$) individuals have a mild form of the disease.

3.5.1 Describe what is meant by *incomplete dominance*. (2)

3.5.2 Give evidence from the information above that shows that inheritance of familial hypercholesterolemia is an example of incomplete dominance. (2)

3.5.3 A man, heterozygous for familial hypercholesterolemia marries a woman who has normal LDL receptors.

In a genetic cross show the percentage chance of them having children with severe hypercholesterolemia.

(6)

(10)

[50]

TOTAL SECTION B: 100

GRAND TOTAL: 150



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GRADE 12

LIFE SCIENCES P2
SEPTEMBER 2024
MARKING GUIDELINES
AMMENDED

MARKS: 148

These marking guidelines consist of 13 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 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 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 unrecognized abbreviation, but credit the rest of 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 given in terminology**
Accept, provided it was accepted at the National memo discussion meeting.
14. **If only letter is asked for and only 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 appears in any official language other than the learners' 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. No changes must be made to the marking guidelines without consulting the Provincial Internal Moderator.



SECTION A

QUESTION 1

- 1.1
- | | | |
|-------|-----|--------------|
| 1.1.1 | C✓✓ | |
| 1.1.2 | A✓✓ | |
| 1.1.3 | C✓✓ | |
| 1.1.4 | D✓✓ | |
| 1.1.5 | D✓✓ | |
| 1.1.6 | A✓✓ | |
| 1.1.7 | D✓✓ | |
| 1.1.8 | C✓✓ | |
| 1.1.9 | C✓✓ | (9 x 2) (18) |
- 1.2
- | | | |
|-------|--------------------------------|-------------|
| 1.2.1 | Stereoscopic✓/Binocular vision | |
| 1.2.2 | Nucleotides✓ | |
| 1.2.3 | Punctuated equilibrium✓ | |
| 1.2.4 | Interphase✓ | |
| 1.2.5 | Discontinuous✓ (variation) | |
| 1.2.6 | Hominins✓ | |
| 1.2.7 | Stem cells✓ | |
| 1.2.8 | Sex-linked✓(characteristics) | |
| 1.2.9 | Cloning✓ | (9 x 1) (9) |
- 1.3
- | | | |
|-------|----------------|-------------|
| 1.3.1 | A only✓✓ | |
| 1.3.2 | Both A and B✓✓ | |
| 1.3.3 | B only✓✓ | (3 x 2) (6) |
- 1.4
- | | | |
|-------|--|------------|
| 1.4.1 | 3✓ | (1) |
| 1.4.2 | The 2/3 DNA bands/black bars on the DNA profile of male 2/3✓
match with the 3 bands on the profile of the girl✓ | (2) |
| 1.4.3 | - Identify suspects of crime✓
- Determine the probability or causes of genetic defects✓/identify
the cures for genetic disorders
- Establish the compatibility of tissue types for organ transplants✓
- Identify missing relatives
- To identify dead bodies✓ | Any (2) |
| | (Mark the first TWO only) | (5) |

- 1.5 1.5.1 Natural selection✓ (1)
- 1.5.2 (a) (Different) doses of antibiotic✓ (1)
(b) Number of harmful bacteria✓ (1)
- 1.5.3 Higher doses of antibiotic✓ results in lower number of harmful bacteria✓
- OR**
- Lower doses of antibiotic ✓ result in higher number of numbers of bacteria✓ (2)
- 1.5.4 It decreases the number of harmful bacteria✓ the most thereby preventing diseases in the cattle✓/resulting in less medical expenses.
- OR**
- Decreasing mortality of cattle✓ by maintaining the number of cattle to sell✓/breed/make profit
(Mark first ONE only) Any (1 x 2) (2)
(7)
- 1.6 1.6.1 (a) Affected✓ female (1)
(b) Aa✓ (1)
(c) aa✓ (1)
- 1.6.2 They have an affected son/a son with albinism/son with aa genotype who had inherited one recessive allele from each of the parents✓
- OR**
- Both Bob and Ann each have parents who are affected✓ and therefore inherited recessive alleles from each parent✓. (2)
(5)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

- 2.1 2.1.1 (a) Spindle fibre✓/spindle thread (1)
- (b) Cell membrane✓ (1)
- 2.1.2 Anaphase II✓ (1)
- 2.1.3 The centromere splits/spindle fibres contract✓ and the (two) chromatids are pulled to opposite poles ✓ (2)
- 2.1.4 Metaphase II ✓ (1)
- 2.1.5 - Result in similar/same gametes✓
 - offspring of the same genotype and phenotype✓ being formed
 - reduced chance of survival/increased chance of extinction and
 - loss of biodiversity✓ Any (3)
- (Mark first THREE only)**
- 2.1.6 Four✓/4 (1)

2.1.5

T✓

Meiosis I	Meiosis II
Crossing over takes place✓	Crossing over does not take✓ place
Homologous chromosomes arrange at the equator in pairs✓	Chromosomes arrange at the equator singly✓
Whole chromosomes move to opposite poles of the cell✓	Chromatids move to opposite poles of the cell ✓
The chromosome number is halved from diploid to haploid✓	The chromosome number remains the same (haploid)✓
Results in two daughter cells✓	Results in four daughter cells✓

Stanmorephysics.com

2 x 2 + 1 for table

(5)
(15)

2.2 2.2.1 The changes/modifications brought about by the frequency of use or disuse ✓ were transmitted/passed on to the offspring ✓ (2)



2.2.2 Organisms do not evolve because they were determined/wanted to change/ ✓ but changes took place randomly due to mutations ✓ (2)

OR

The characteristics acquired by an organism through use or disuse do not affect the organism's genetic makeup ✓ therefore cannot be inherited ✓

OR

There is no evidence ✓ to show that acquired characteristics are inherited ✓

OR

The characteristics acquired by an organism in its lifetime ✓ cannot be inherited ✓

(4)

2.3 2.3.1 There are THREE different allele that control inheritance of blood groups ✓ ✓ (2)

2.3.2 2 ✓ (1)

2.3.3 It is used to exclude a man from being a child's father ✓ ✓ (2)

OR

To narrow down the possible fathers ✓ ✓

(5)

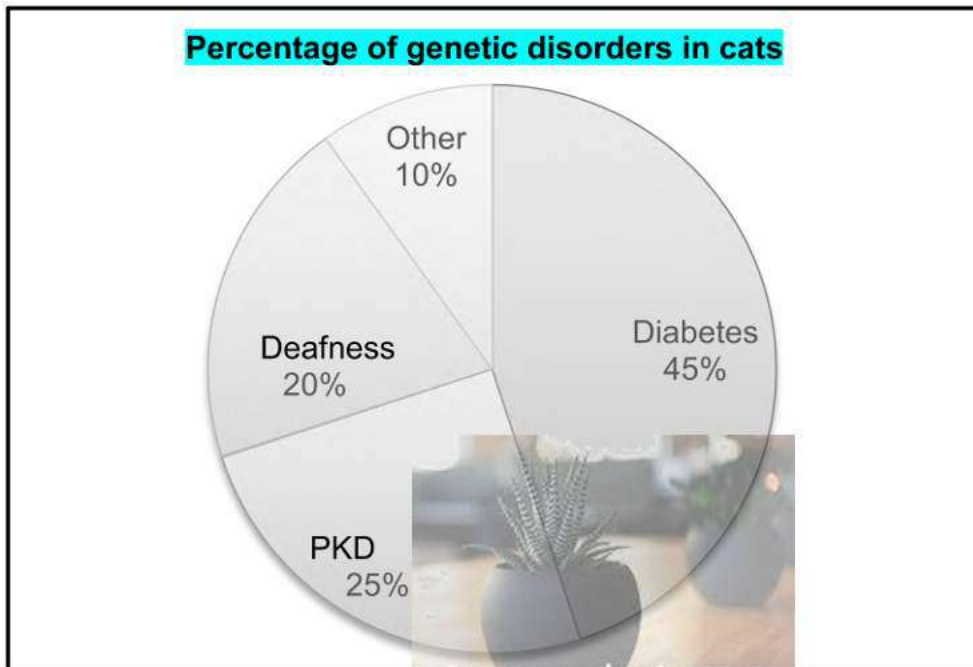


2.4 2.4.1 The changes to the sequence✓ of nitrogenous bases in a DNA molecule✓ (2)



2.4.2 Used 200✓ cats (1)

2.4.3



Calculations:

Diabetes: $45/100 \times 360^\circ = 162^\circ$
 PKD $25/100 \times 360^\circ = 90^\circ$
 Deafness: $20/100 \times 360^\circ = 72^\circ$
 Other: $10/100 \times 360^\circ = 36^\circ$

} ✓✓

Rubric for marking the graph:

Criteria	Mark
Correct type of graph (T)	1
Caption/Heading with 2 (H) variables	1
Correct calculations (C)	2
Plotting (P)	1 – 3 correct slices: 1 All four correct slices: 2

(6)
(9)

- 2.5 2.5.1 (a) Transcription✓ (1)
- (b) Nucleus✓
- Mitochondrion✓
- Chloroplast✓ Any (2)
- (Mark the first TWO only)**
- (c) Adenine✓ (1)
- 2.5.2 - Each tRNA carries a specific amino acid✓
- When the anticodon on the tRNA✓
- matches the codon on the mRNA✓
- then tRNA brings the required amino acid✓ to the ribosome✓
- Amino acids become attached to each other by peptide bonds✓
- to form the required protein✓ Any (6)
- 2.5.3 GGU✓ (1)
- 2.5.4 -the anticodon will change to UAG✓ instead of UAC
- that will code for a different amino acid✓
- resulting into a change in the **(sequence)** of amino acids✓
- leading to a slightly different structure of protein ✓ Any (3)
- 2.5.5 Methionine✓ - glycine✓ - arginine✓ (in correct sequence) (3)
- (17)**
- [50]**



QUESTION 3

- 3.1 3.1.1 A group of organisms sharing the similar/ same characteristics✓
that are able to interbreed✓ to produce fertile✓ (3)
- 3.1.2 -The original population of shrubs became separated into three sub-
populations✓* by continental drift/ocean/water✓
- no gene flow amongst the (three) sub populations✓
- each population experienced different environmental
conditions✓
- and underwent natural selection independently✓
- the shrubs in each population became different✓
- genotypically and phenotypically✓
- Even if they were to mix again/cross pollinate ✓, they will not be able
interbreed✓/to produce fertile population of shrubs
- because they are now three different species✓* in South America,
Africa and Australia **2 compulsory** * + Any 5 (7)
- 3.1.3 - Species-specific courtship behavior✓
- Breeding at different times of the year✓
- Infertile offspring✓
- Adaptation to different pollinators✓
- Prevention of fertilization✓ Any (2)
(Mark the first TWO only)

(12)

- 3.2 3.2.1 M✓ (1)
- 3.2.2 Foramen magnum is in a (more) forward position✓✓ (2)
- 3.2.3 It is long✓ and narrow✓ (2)
- 3.2.4 Jaw of skull **K** is less prognathous/less protruding/non-prognathous✓, that of skull **L** is more prognathous/more protruding/prognathous✓
- The palate of skull **K** is short and semi-circular/more rounded✓, that of skull **L** is long and rectangular/U-shaped✓
- The canines of skull **K** is short✓/small, those of skull **L** is long✓/ large and pointed
- There are no spaces between the teeth/diastema in skull **K**✓, in skull **L** there are spaces between the teeth✓/diastema
(Mark the first TWO only) Any (2 x 2) (4)
(9)
- 3.3 3.3.1 Phylogenetic tree/cladogram✓ (1)
- 3.3.2 3,1 /3,0 mya✓ (1)
- 3.3.3 *Homo habilis*✓
Homo sapiens✓
Paranthropus robustus✓
Paranthropus boisei✓ Any (2)
- 3.3.4 Increase in brain size/bigger brain size✓✓ to allow for:
 Increased intelligence ✓✓
 storing and processing of large information✓✓
 processing large information quickly✓✓ Any 1 x 2 (2)
- 3.3.5 No answer
- 3.3.6 The fossils of *Ardipithecus*, *Australopithecus* and *Homo habilis* are found in Africa **only**✓
 The **oldest fossils** of *Homo erectus* and *Homo sapiens* are found in Africa✓ and
 the **youngest fossils** are found in other continents (Asia, Europe)✓
 Any (2)
(10)

3.4 3.4.1 Two ✓ /2 (1)

3.4.2 BbEe ✓, bbee ✓ (2)

3.4.3 (a) Brown fur with long ears ✓ ✓ (2)

(b) BE, Be, bE and be ✓ ✓ (2)

3.4.4 Alleles of different genes segregate/move independently of each other ✓ into the gamete so that they appear on the gametes in different combinations ✓ (2)

OR

The various 'factors' controlling the different characteristics are separate entities ✓, not influencing each other in any way, and sorting themselves out independently during gamete formation ✓

OR

A pair of alleles (factors) controlling a particular characteristic separate independently ✓ and then recombine differently to form gametes ✓.

(9)

3.5 3.5.1 Neither of the alleles are dominant over each other ✓.
An intermediate phenotype is obtained when both alleles are present ✓ (2)

OR

Neither one of the two alleles of a gene is dominant over the other ✓, resulting in an intermediate phenotype in the heterozygous condition ✓.

3.5.2 Individuals with genotype $H^N H^S$ / heterozygous genotype have a mild form of the disease. ✓ ✓. (2)





3.5.3

P₁ Phenotype Man with Mild hypercholesterolemia x Normal Woman ✓ / A woman without hypercholesterolemia

Genotype $H^N H^S$ x $H^N H^N$ ✓

Meiosis Gametes

Fertilization

F₁ Genotype $H^N H^N$ $H^N H^N$ $H^N H^S$ $H^N H^S$ ✓

Phenotype 2 Normal individuals/without hypercholesterolemia: 2 Individuals with mild hypercholesterolemia ✓
0% ✓ * chance for children with severe hypercholesterolemia

P₁ and F₁ ✓
Meiosis and fertilization ✓

***1 compulsory mark + Any 5**

OR

P₁ Phenotype Man with Mild hypercholesterolemia x Normal Woman ✓ / A woman without hypercholesterolemia

Genotype $H^N H^S$ x $H^N H^N$ ✓

Meiosis

Fertilization

Gametes	H^N	H^S
H^N	$H^N H^N$	$H^N H^S$
H^S	$H^N H^N$	$H^N H^S$

1 mark for correct gametes
1 mark for correct genotypes

F₁ Phenotype 2 Normal individuals/without hypercholesterolemia: 2 Individuals with mild hypercholesterolemia ✓
0% ✓ * chance for children with severe hypercholesterolemia

P₁ and F₁ ✓
Meiosis and fertilization ✓

***1 compulsory mark + Any 5 (6)**
[48]

TOTAL SECTION B: 98
GRAND TOTAL: 148