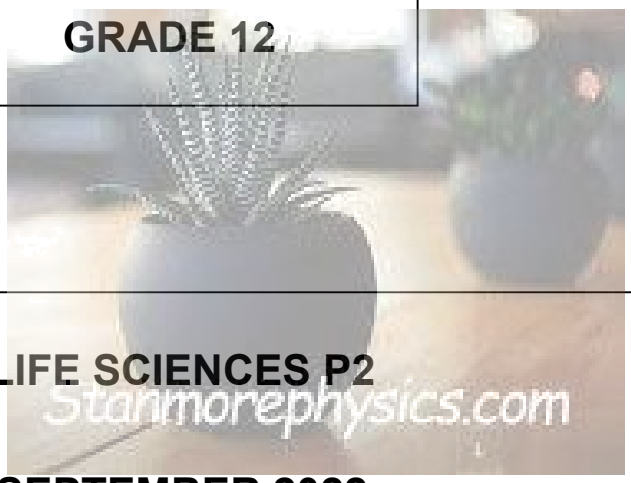
education
MPUMALANGA PROVINCE
REPUBLIC OF SOUTH AFRICA

PREPARATORY EXAMINATION

GRADE 12



LIFE SCIENCES P2

SEPTEMBER 2022

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 your 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. ALL drawings should be done in pencil and labelled in blue or black ink.
7. Draw diagrams 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 may use a non-programmable calculator, protractor and a compass.
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 to D) next to the question number (1.1.1 to 1.1.10) in your ANSWER BOOK, for example 1.1.11 D.

1.1.1 The process where one DNA molecule produces two identical DNA molecules is called …

A reproduction.
B replication.
C translation.
D transcription.

1.1.2 If half of a population mates in January and the other half mates in June, they will eventually become different species.

Which ONE of the following correctly describes the reproductive isolation mechanism given above?

A Different courtship patterns
B Species-specific courtship behaviour
C Prevention of fertilisation
D Breeding at different times of the year

1.1.3 When a DNA template strand that contains 22% adenine bases is transcribed, the mRNA produced will have …

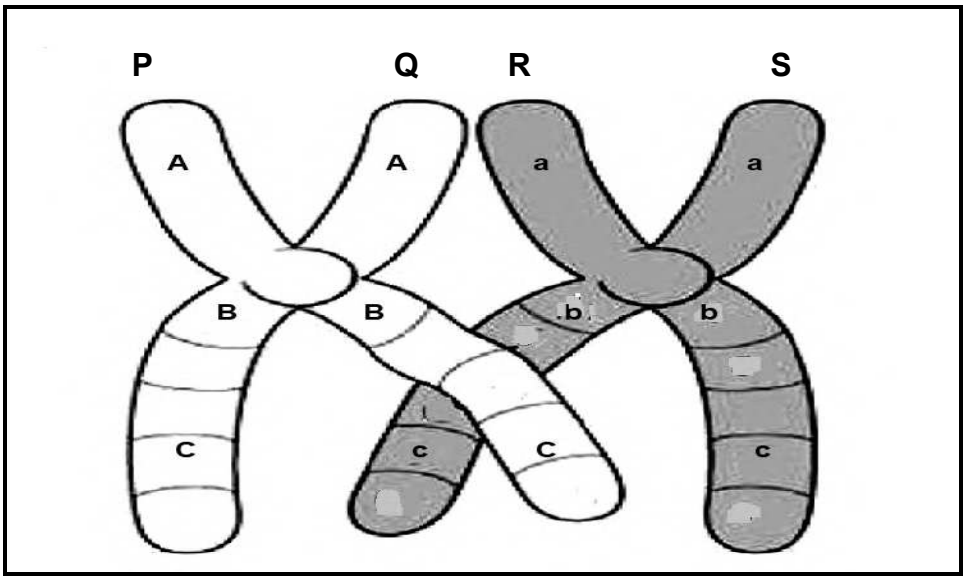
A 22% thymine bases.
B 22% cytosine bases.
C 22% uracil bases.
D 22% guanine bases.

1.1.4 In an investigation, a chemical was used to prevent spindle fibres from forming in cells. This chemical was added to cells in the anthers of the flowers of rice plants. Each cell in the anther has 24 chromosomes.

What is the expected number of chromosomes in each daughter cell at the end of meiosis?

A 12 replicated chromosomes
B 24 replicated chromosomes
C 24 unreplicated chromosomes
D 48 unreplicated chromosomes

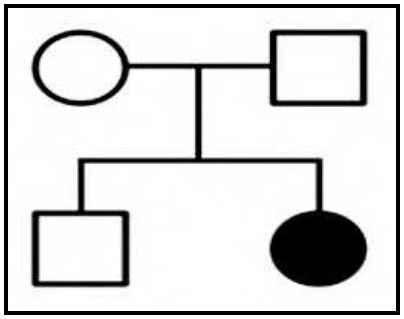
1.1.5 The diagram below represents one pair of homologous chromosomes during crossing over.



The allele sequence for chromatid **S** after the completion of crossing over will be…

A A, B, c
B A, b, C
C a, b, c
D a, b, C

1.1.6 The diagram below shows the pattern of inheritance of a disorder.



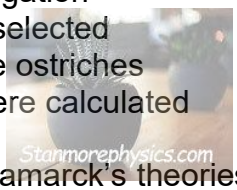
One can conclude that the disorder is caused by a …

A recessive allele, with both parents homozygous recessive.
B recessive allele, with both parents heterozygous.
C dominant allele, with one parent heterozygous while the other is homozygous dominant.
D dominant allele, with both parents homozygous recessive.

1.1.7 A scientist wanted to determine the variation in neck length of adult male ostriches.

Which ONE of the following steps was done to ensure the validity of the investigation?

A Permission was obtained to conduct the investigation
B A random sample of adult male ostriches was selected
C He measured the neck lengths of 65 adult male ostriches
D The average neck length of the 65 ostriches were calculated



1.1.8 Which of the following indicates that Darwin's and Lamarck's theories are similar?

A Acquired characteristics of organisms are passed from parents to offspring.
B Population as a whole changes.
C Evolution depends on changes in the environment.
D Evolution happens very rapidly

1.1.9 Some genes from the bacterium *E. coli* have sequences that are similar to genes found in humans.

This statement is an example of which type of evidence?

A Biogeography
B Fossil
C Genetic
D Modification by descent

1.1.10 The table below compares the rate of extinction of mammal species over two different time periods.

TIME PERIOD (YEARS	RATE OF EXTINCTION (PER 100 YEARS)
1500–1900	**4,5**
1900–2000	**90**

What is the ratio between the rate of extinction from 1500 to 1900 compared to the rate of extinction from 1900 to 2000?

A 1: 20
B 1: 2
C 2: 1
D 20: 1

(10 x 2) **(20)**

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 1.2.10) in your ANSWER BOOK.

1.2.1 The monomers of DNA

1.2.2 The bond formed between two monomers of a protein

1.2.3 Structures formed when the centrosome divides into two

1.2.4 Chromosomes involved in sex determination

1.2.5 An arrangement of black bars representing DNA fragments that can be used to determine whether people are related

1.2.6 The number, size and shape of chromosomes in a body cell

1.2.7 The period between two consecutive cell divisions

1.2.8 The family to which humans belong

1.2.9 Specific parts of DNA that carry the codes for characteristics of organisms

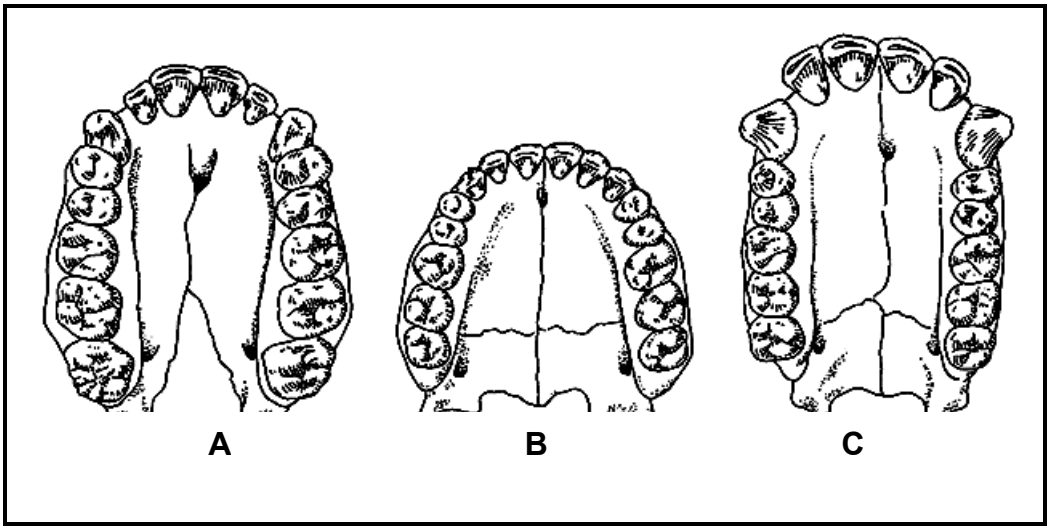
1.2.10 The different characteristics that occur naturally from one individual to another in a population (10 x 1) **(10)**

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 number (1.3.1 to 1.3.4) in the ANSWER BOOK.

COLUMN I		COLUMN II	
1.3.1	The significance of RNA	A: B:	Replicates DNA Reduces the number of chromosomes
1.3.2	The site of protein synthesis	A: B:	Mitochondrion Ribosomes
1.3.3	The pairing of chromosomes	A: B:	Mutation Non-disjunction
1.3.4	Capable of bipedal locomotion	A: B:	*Homo erectus* *Australopithecus africanus*

(4 x 2) **(8)**

1.4 The diagram below shows the dentition of three genera.



1.4.1 Give only the LETTER(S) (**A, B or C**) of the organisms that is/are:

(a) Most likely to eat raw food only. (2)

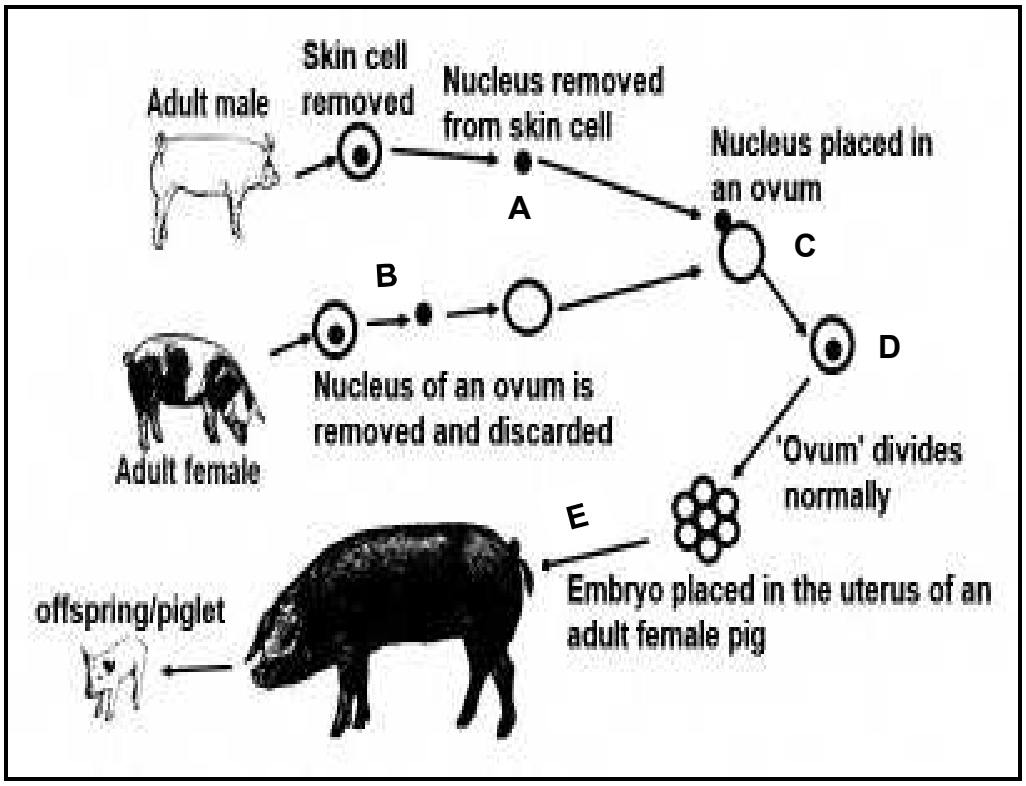
(b) Most likely to eat soft, cooked food. (1)

1.4.2 Which diagram (**A**, **B** or **C**) represents the dentition of *Australopithecus afarensis*? (1)

1.4.3 Give ONE observable reason for your answer to QUESTION 1.4.2 (1)

1.4.4 Give the correct sequence of the organisms (**A, B** and **C**) from most primitive to most evolved. (2)
(7)

1.5 The diagram below shows a genetic engineering process. A donor cell was taken from the skin cell of a male pig to create a new offspring.



1.5.1 Name the genetic engineering process shown in the diagram above. (1)

1.5.2 Name the type of cell division through which:

(a) Cell **D** divides. (1)

(b) Ovum **B** is produced. (1)

1.5.3 A somatic cell in a pig contains **38** chromosomes.

How many chromosomes would there be in:

(a) Structure **A** (1)

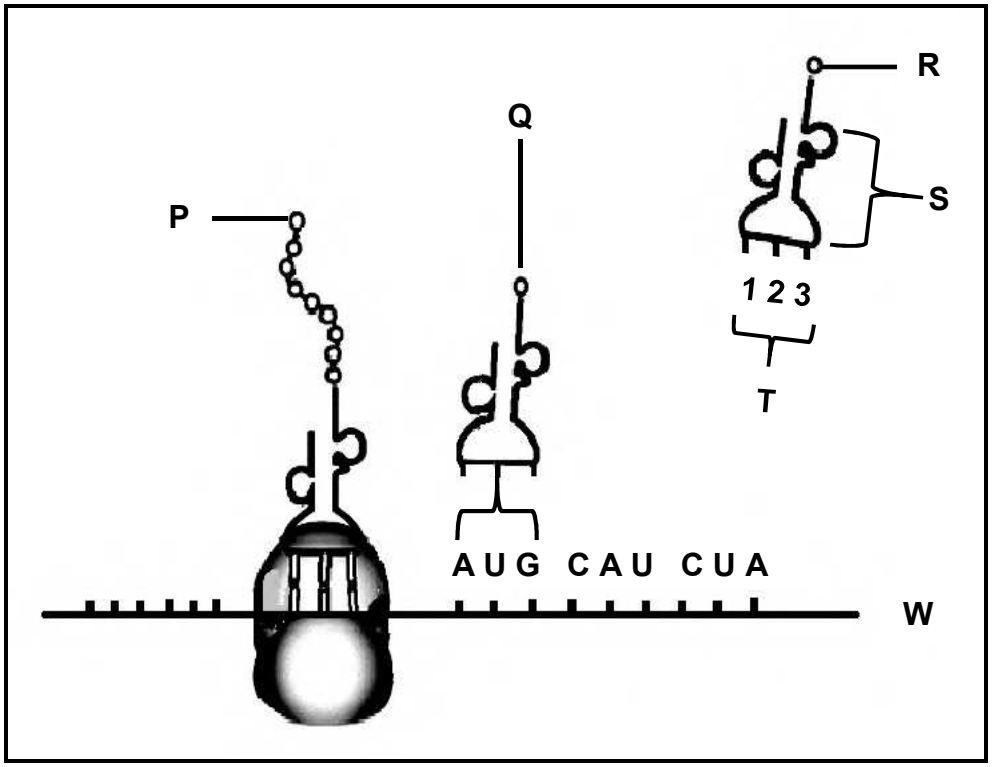
(B) A skin cell in organism **E** (1)
(5)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 The diagram below represents a stage of protein synthesis.



2.1.1 Identify molecule:

(a) **P** (1)

(b) **S** (1)

2.1.2 If **R** is the next amino acid required after **Q**, then identify:

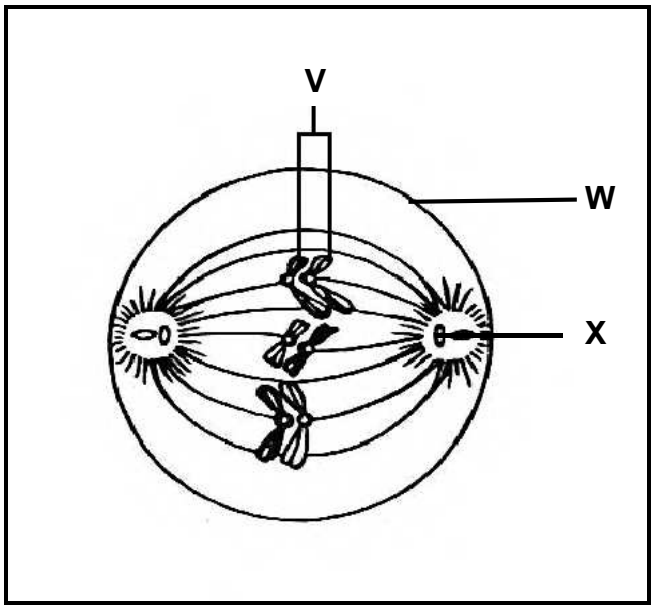
(a) Anticodon **T** (2)

(b) The DNA base triplet that codes for **R**. (2)

2.1.3 Describe the role of DNA during the formation of molecule **W**. (2)

2.1.4 Name and describe the process represented in the diagram. (7)
(15)

2.2 The diagram below represents a phase of meiosis in animals.



2.2.1 Identify the phase represented by the diagram. (1)

2.2.2 Give ONE visible reason for your answer to QUESTION 2.2.1. (1)

2.2.3 Label part **W**. (1)

2.2.4 State ONE function of part **X**. (1)

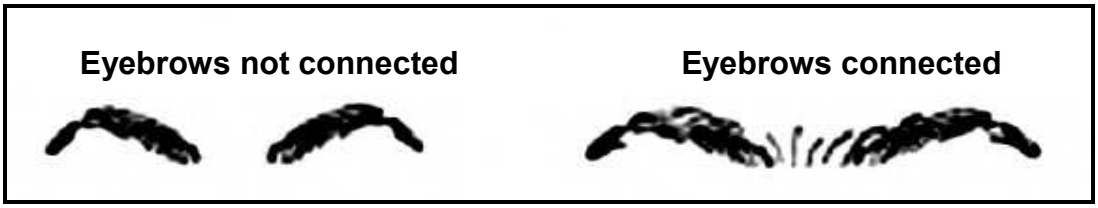
2.2.5 Name the female organ where meiosis occurs. (1)

2.2.6 Give the number of chromosomes in each cell at the end of meiosis represented by this diagram. (1)

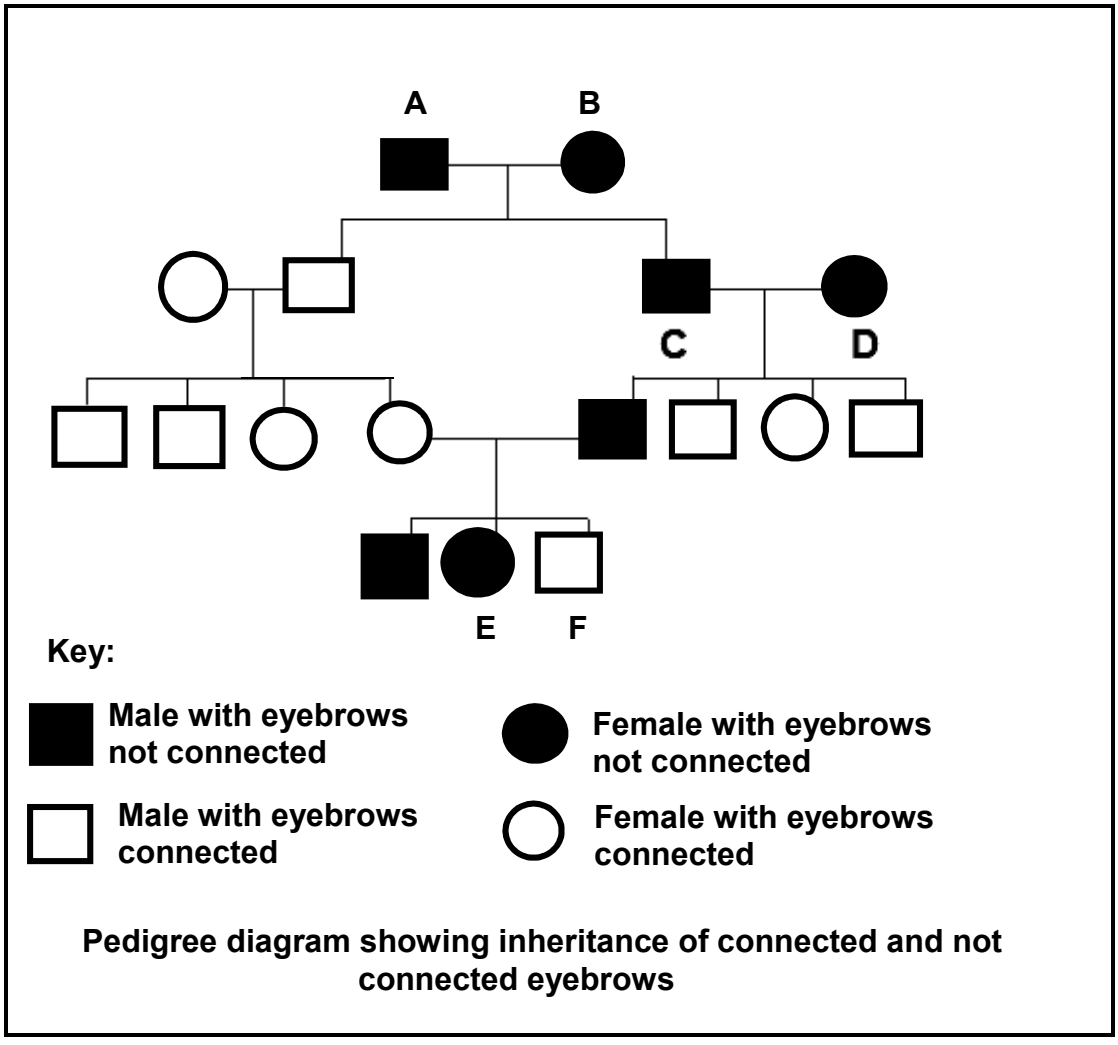
2.2.7 List THREE characteristics that the two structures indicated by **V** have in common. (3)

2.2.8 Explain TWO ways in which meiosis is important. (4)
(13)

2.3 Human eyebrows are either connected or not connected to each other.



The pedigree diagram below shows the inheritance of 'connected' and 'not connected' eyebrows in a family.



Pedigree diagram showing inheritance of connected and not connected eyebrows

2.3.1 Which type of eyebrows is controlled by the dominant allele? (1)

2.3.2 Give a reason for your answer to QUESTION 2.3.1 using evidence from the pedigree diagram. (2)

2.3.3 State the number of:

(a) Generations represented in this pedigree diagram (1)

(b) Offspring of individuals **C** and **D** (1)

2.3.4 What percentage of the females in this family has connected eyebrows? Show ALL workings. (2)

2.3.5 State Mendel's law of dominance. (2)
(9)

2.4 Blood groups are an inherited characteristic. The table below shows the percentage people in a community with each of the different blood groups.

Blood group	**O**	**A**	**B**	**AB**
Percentage of the community (%)	46	35	14	5

2.4.1 How many genes control blood groups? (1)

2.4.2 (a) What is the blood group of an individual with the genotype $I^A I^B$? (1)

(b) How does the inheritance of the blood group mentioned in QUESTION 2.4.2(a) differ from the inheritance of other blood groups? (1)

2.4.3 Give the possible genotypes for blood group **A**. (2)

2.4.4 Explain how it is genetically possible to have four blood groups in a community. (2)

2.4.5 Draw a bar graph to represent the information in the table. (6)
(13)

[50]

QUESTION 3

3.1 A group of learners investigated the frequency of dominant and recessive genetic traits in their school. Their hypothesis was:

There are more learners with dominant genetic traits than learners with recessive genetic traits.

They investigated 200 learners for the following traits:

DOMINANT TRAIT	RECESSIVE TRAIT
Unattached earlobe	Attached earlobe
Rolled tongue	Unrolled tongue
Bent little finger	Straight little finger

The table below shows the results obtained.

	NUMBER OF LEARNERS	
TRAIT	DOMINANT	RECESSIVE
Earlobe	70	130
Tongue	24	176
Little finger	15	185

3.1.1 Identify the independent variable for this investigation. (1)

3.1.2 Explain why the age of the learners need NOT be controlled in this investigation. (2)

3.1.3 State ONE way in which the learners can increase the reliability of their results. (1)

3.1.4 List ONE planning step the learners had to follow before starting to collect the data. (1)

3.1.5 Will the learners accept or reject their hypothesis? (1)

3.1.6 Explain your answer to QUESTION 3.1.5. (2)
(8)

3.2 Haemophilia is a sex-linked disorder that causes excessive bleeding due to a lack of the blood clotting protein. This disorder is caused by a recessive allele on the X-chromosome (X^h)

3.2.1 Explain why this disorder affects mostly males in a family. (3)

3.2.2 A man with haemophilia and a woman who is heterozygous for haemophilia, decide to have children.

Use a genetic cross to show all the possible genotypes of their children. (6)
(9)

3.3 Scientists carried out an investigation to determine the development of insecticide resistance of insects. A population of insects was treated with an insecticide from the year 1995 to 1998. The percentage that was resistant to the insecticide was calculated.

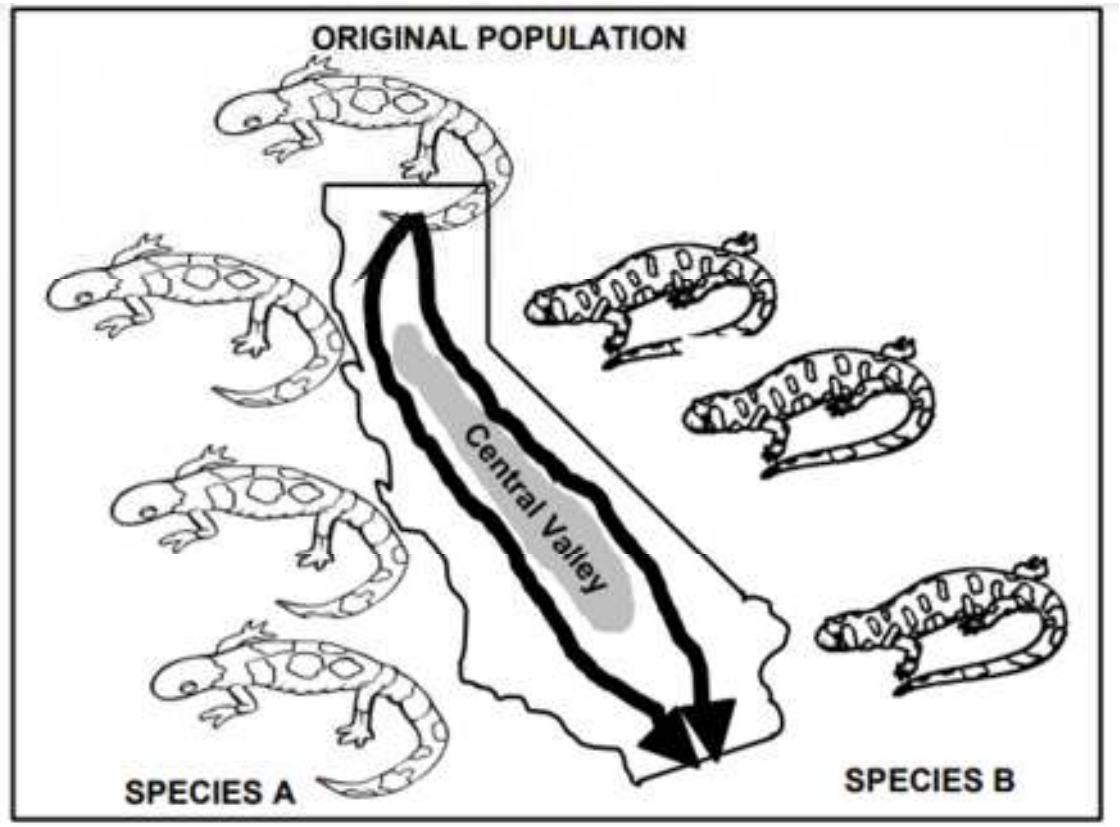
The table below shows data from an insect population in 1995 and 1998.

CHANGE IN THE RESISTANCE TO INSECTICIDE IN AN INSECT POPULATION		
Characteristic	**Percentage of population in 1995**	**Percentage of population in 1998**
Resistance	0,15	99,1

3.3.1 Describe the change in the insecticide resistance of the insect population between 1995 and 1998. (2)

3.3.2 Describe how natural selection caused insecticide resistance in this population. (7)
(9)

3.4 The diagram below shows an evolutionary process taking place in a population of salamanders. The process took place gradually, millions of years ago. Study the diagram and answer the questions that follow.

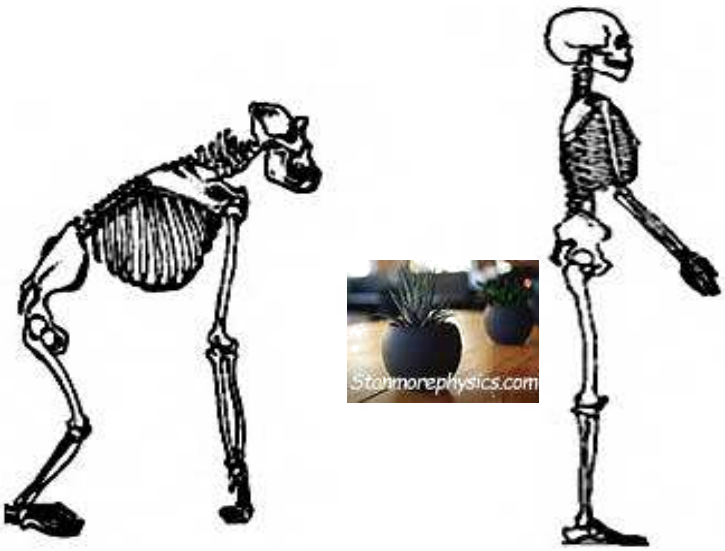


3.4.1 Which evolutionary process is shown in the diagram? (1)

3.4.2 Use the diagram to explain how species **B** evolved from the original species. (6)

3.4.3 Explain why this is not an example of punctuated equilibrium. (4)
(11)

3.5 The diagrams below show the skeletons of a gorilla and a human.



3.5.1 State THREE characteristics of the upper limbs that are the same in both species. (3)

3.5.2 Name TWO *Australopithecus* fossils that were found in South Africa. (2)

3.5.3 Explain the significance of the change of the pelvis towards bipedalism. (4)

3.5.4 Explain how genetic evidence supports the hypothesis that all living humans are "Out of Africa". (4)
(13)

[50]

TOTAL SECTION B: 100
GRAND TOTAL: 150

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REPUBLIC OF SOUTH AFRICA

PREPARATORY EXAMINATION

GRADE 12

LIFE SCIENCES P2

SEPTEMBER 2022

MARKING GUIDELINES

MARKS: 150

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 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 relevant part.

4. **If comparisons are asked for and 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 annotation 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 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 is accepted at the provincial 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.

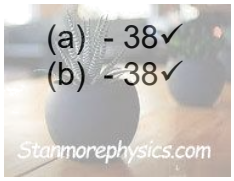
19. **Changes on the marking guideline**
No changes must be made to the marking guidelines without consulting the Provincial Internal Moderator.

SECTION A

QUESTION 1

1.1	1.1.1	B✓✓		
	1.1.2	D✓✓		
	1.1.3	C✓✓		
	1.1.4	B✓✓		
	1.1.5	D✓✓		
	1.1.6	B✓✓		
	1.1.7	B✓✓		
	1.1.8	C✓✓		
	1.1.9	C✓✓		
	1.1.10	A✓✓	(10 x 2)	**(20)**
1.2	1.2.1	Nucleotides✓		
	1.2.2	Peptide✓bond		
	1.2.3	Centrioles✓		
	1.2.4	Gonosomes✓		
	1.2.5	DNA profile✓		
	1.2.6	Karyotype✓		
	1.2.7	Interphase✓		
	1.2.8	Hominidae✓		
	1.2.9	Genes✓		
	1.2.10	Variation✓	(10 x 1)	**(10)**
1.3	1.3.1	None✓✓		(2)
	1.3.2	B only✓✓		(2)
	1.3.3	None✓✓		(2)
	1.3.4	Both A and B✓✓		(2)
			(4 x 2)	**(8)**
1.4	1.4.1	(a) - A✓ and C✓		(2)
		(b) - B✓		(1)
	1.4.2	A✓		(1)
	1.4.3	- Small gaps between the teeth✓/diastema - U-shaped palate✓ **(Mark first ONE only)**	Any 1	(1)
	1.4.4	C → A →B✓✓		(2)
				(7)

1.5	1.5.1	Cloning✓	(1)
	1.5.2	(a) - Mitosis✓	(1)
		(b) - Meiosis✓	(1)
	1.5.3	(a) - 38✓	(1)
		(b) - 38✓	(1)
			(5)



TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 2.1.1 (a) - Amino acid✓ (1)
(b) - tRNA✓ (1)

2.1.2 (a) - GUA✓✓ (2)
(b) - GTA✓✓ (2)

2.1.3 - DNA provides the code for a particular protein✓
- One strand is used as a template✓ to form the molecule **W/**mRNA (2)

2.1.4 Translation✓*
- Each t-RNA carries a specific amino acid✓
- according to its anticodon✓
- The anticodon attaches to the complementary codon✓
- on mRNA✓
- Then t-RNA brings the required amino acid to the ribosome✓
- arranging the amino acids in a specific sequence.✓
- Amino acids become attached by peptide bonds✓
- to form the required protein.✓

1 Compulsory* + any 6 (7)
(15)

2.2.1	Metaphase I✓		(1)
2.2.2	- Chromosomes align in pairs at the equator✓/ homologous chromosomes align in pairs at the equator of the cell		(1)
2.2.3	Cell membrane✓		(1)
2.2.4	- Forms spindle fibres✓ - Attaches spindle fibres to centromere✓		(1)
2.2.5	Ovary✓/ovule		(1)
2.2.6	(a) 3✓		(1)
2.2.7	- Same size✓/length/height - Same shape✓ - Same position of centromeres✓ - Same position of genes✓/alleles - Genes coding for the same characteristics✓ **(Mark first THREE only)**	Any 3	(3)
2.2.8	- Exchange of genetic material✓ - introduces variation✓ - Random arrangement of chromosomes✓ - to cause genetic variation✓ - Reduction of chromosome number to haploid✓ - to keep the chromosome number constant from generation to generation✓ - Forms four haploid cells✓ - which function as gametes✓ **(Mark first TWO only)**	(Any 2 x 2)	(4) **(13)**

2.3 2.3.1 Eyebrows not connected✓ (1)

2.3.2
- Parents **A** and **B** or **C** and **D** produce children with connected eyebrows✓
- and not connected eyebrows✓
- Only parents both carrying the dominant allele can
- produce offspring with both phenotypes✓

OR

- **A** and **B** or **C** and **D** have eyebrows that are not connected, produce a child with eyebrows which are connected✓
- then the allele for connected eyebrows was present in both parents✓,
- but masked✓, so eyebrows that are connected is recessive.

Any 2 (2)

2.3.3 (a) 4/FOUR✓ (1)

(b) 4/FOUR✓ (1)

2.3.4 [4/7 x 100]✓ = 57,14✓% (2)

2.3.6 In a heterozygous condition the dominant allele expresses itself in the phenotype✓, masking the effect of the recessive allele✓

OR

When two individuals with pure breeding contrasting characteristics are crossed ✓the offspring will display the dominant characteristic✓ (2)
(9)

2.4 2.4.1 One gene✓ (1)

2.4.2 (a) AB✓ (1)

(b) - In the other blood groups, the phenotypes show only one of the genes in the genotype✓, because the one dominates the other.

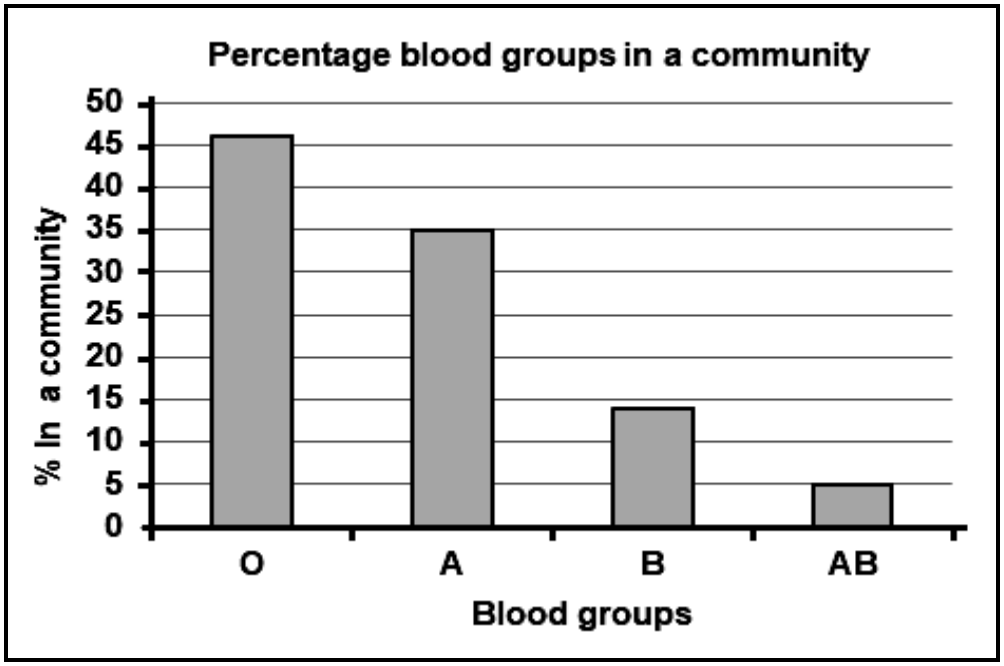
OR

- In this blood group the alleles are co-dominant✓ (1)

2.4.3 I^AI^A✓
I^Ai✓ (2)

2.4.4 Blood groups are controlled by three alleles✓ I^A, I^B and i which, when in combination, provide four phenotypes ✓(A, AB, B, O). (2)

2.4.5



Criteria	Mark Allocation	Mark
Correct type of graph **(T)**	Bar graph drawn	1
Caption for graph (**C**)	Both variables included	1
Axes labels **(L)**	X- and Y-axis correctly labelled with units	1
Scale for X-and Y-axis**(S)**	-Equal space between bars and width of bars for X-axis and -Correct scale for Y-axis	1
Plotting of bars **(P)**	-1 to 3 bars plotted correctly -All 4 bars plotted correctly	1 2

(6)

NOTE:

- If the wrong type of graph is drawn:

  Marks will be lost for 'correct type of graph'
- and if a line graph is drawn marks for plotting of bars will be lost
- If axes are transposed: marks will be lost for labelling and scaling of X-axis and Y axis

(13)
[50]

QUESTION 3

3.1	3.1.1	Genetic traits✓	(1)
	3.1.2	These traits are inherited✓ and not influenced by age✓	(2)
	3.1.3	- Increase the number of learners✓ - Repeat the investigation✓ **(Mark first ONE only)**	(1)
	3.1.4	- Get permission from school and parents to do the investigation✓ - Decide on venue✓where data will be collected - Day/time when data will be collected✓ - Make sure that a random distribution of boys and girls are monitored✓ - Plan how the data will be collected and recorded✓ **(Mark first ONE only)** Any 1	(1)
	3.1.5	Reject✓	(1)
	3.1.6	More learners displayed the recessive traits compared to the dominant traits✓✓	(2) **(8)**

3.2 3.2.1 - The allele for the trait is carried on the X-chromosome✓
- Males only have one X-chromosome✓
- A male therefore only needs one recessive allele✓to have haemophilia
- A female must have two recessive alleles to have haemophilia✓ (3)

3.2 3.2.2 P_1 Phenotype Man with haemophilia x Heterozygous women✓
Genotype X^hY x X^HX^h✓

Meiosis
G/Gametes X^h , Y x X^H , X^h✓

Fertilisation
F_1 Genotype $X^H X^h$, $X^h X^h$, X^HY, $X^h Y$ ✓*
Phenotype 25% boys without haemophilia: 25% boys with haemophilia
25% girls with haemophilia: 25% girls which are carriers✓
P_1 and F_1✓
Meiosis and fertilisation✓ ***1 compulsory + Any 5**

OR

P_1 Phenotype Haemophilia x Carrier✓
Genotype X^hY x X^HX^h✓

Meiosis

Fertilisation

Gametes	X^h	Y
X^H	$X^H X^h$	X^HY
X^h	$X^h X^h$	$X^h Y$
1 mark for correct gametes 1 mark for correct genotypes*		

F_1 Genotype $X^H X^h$, $X^h X^h$, X^HY, $X^h Y$ ✓*
Phenotype 25% boys without haemophilia: 25% boys with haemophilia
25% girls with haemophilia: 25% girls which are carriers✓ (6)

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

(9)

3.3 3.3.1 - There was an increase in the percentage of resistant insects✓ from 0,15% (in 1995) to 99,10%✓ (in 1998) (2)

3.3.2
- There is variation in the insect population✓
- Some were resistant and some were not✓
- When the insecticide was first used, it killed off a large number of non-resistant insects✓
- Some insects were resistant to the insecticide and survived✓
- Those that survived were able to reproduce✓
- Thereby passing on the allele (gene) for resistance to offspring✓
- Continued use of the insecticide had little effect on the resistant insects✓
- Therefor the resistant insects increased ✓and the
- non-resistant insects decreased ✓ Any 7 (7)

(9)

3.4 3.4.1 Speciation✓ (1)

3.4.2
- The original population of salamander became separated✓into two
- **by the central valley***✓/geographical barrier (Compulsory)
- No gene flow occurred between the populations✓
- Each population was exposed to different environmental
- conditions/selection pressure✓
- Natural selection occurred independently in each population✓
- The individuals in each population became different✓
- genotypically and phenotypically✓ from each other
- Even if the two populations were to mix✓
- they would be unable to interbreed/ reproduce✓
- resulting in the formation of species **B**.✓

1 compulsory* + Any 5 (6)

3.4.3 In punctuated equilibrium:

- Evolution will involve long periods of time ✓ where species do not change /very little change occurs✓
- and this will alternate with short periods of time where rapid changes✓occur
- New species are formed in a short period of time✓
- supported by the absence of transitional fossils✓ Any 4 (4)

(11)

3.5	3.5.1	- Freely rotating arms ✓ - Long upper arms✓ - Elbow joints which allow rotation of forearms✓ - Rotating hands✓ - Flat nails instead of claws✓ - Opposable thumbs✓ **(Mark first THREE only)**	Any 3	(3)
	3.5.2	- Little Foot✓ - Taung child✓ / *Australopithecus africanus* - Mrs Ples✓/ *Australopithecus africanus* - Karabo✓ / *Australopithecus sediba* **(Mark first TWO only)**	Any 2	(2)
	3.5.3	- It became wide and short✓ - and have a bowl shape✓ - to hold the weight✓ of the body - making upright walking possible✓		(4)
	3.5.4	- Mitochondrial DNA (mtDNA) ✓ - is only inherited through the maternal line✓ - analysis of the mutation on the mtDNA✓ - shows that the oldest female ancestor was located in Africa✓ - and that all humans descended from her/mitochondrial Eve✓ - the Y chromosome shows the paternal line ✓	Any 4	(4) **(13)**
			TOTAL SECTION B	**50**
			GRAND TOTAL:	**150**