basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES P2

NOVEMBER 2024

MARKS: 150

TIME: 2½ hours

This question paper consists of 14 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. 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 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 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 1.1.10) in the ANSWER BOOK, e.g. 1.1.11 D.

1.1.1 Which ONE of the following organelles is the site of protein synthesis?

A Ribosomes
B Chloroplasts
C Mitochondria
D Centrosomes

1.1.2 In humans, the gonosomes determine the gender.

Which combination below shows the CORRECT gonosomes for males and females?

	MALE GONOSOMES	FEMALE GONOSOMES
A	XY	YY
B	YY	XY
C	XY	XX
D	XX	XY

1.1.3 An organism has the genotype TT.

The CORRECT term which describes this organism's genotype is …

A heterozygous dominant.
B heterozygous recessive.
C homozygous dominant.
D homozygous recessive.

1.1.4 Down syndrome is a genetic disorder where an individual has an extra copy of chromosome 21.

Which ONE of the following may lead to Down syndrome?

A Failure of chromosomes to replicate during mitosis
B Failure of chromosome pairs to separate during meiosis
C Failure of chromosomes to form pairs during fertilisation
D Failure of chromosome pairs to cross over during meiosis

1.1.5 A gradual change in the characteristics of a species over time is known as …

A punctuated equilibrium.
B genetic engineering.
C speciation.
D biological evolution.

1.1.6 Which ONE of the following is a reproductive isolation mechanism?

A Adaptation to the same pollinator
B Species-specific courtship behaviour
C Production of fertile offspring
D Breeding at the same time of the year

1.1.7 Analysis of mitochondrial DNA is an example of this line of evidence:

A Fossil evidence
B Modification by descent
C Biogeography
D Genetic evidence

1.1.8 Which option in the table below shows the CORRECT comparison between mitosis and meiosis?

	MITOSIS	MEIOSIS
A	Produces four daughter cells	Produces two daughter cells
B	Produces genetically different cells	Produces genetically identical cells
C	The chromosome number remains the same	The chromosome number is halved
D	Two divisions occur	Four divisions occur

1.1.9 Which ONE of the following scientists discovered the fossil Taung Child?

A Lee Berger
B Ron Clarke
C Raymond Dart
D Robert Broom

1.1.10 Which ONE of the following is produced at the end of translation?

A A DNA molecule
B A messenger RNA molecule
C A protein
D An amino acid (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 numbers (1.2.1 to 1.2.9) in the ANSWER BOOK.

1.2.1 A nucleic acid that carries hereditary information

1.2.2 The chromosome condition of a cell that has a single set of chromosomes

1.2.3 The structure that holds the two chromatids of a chromosome together

1.2.4 The type of RNA that carries specific amino acids to the site of protein synthesis

1.2.5 The analysis of DNA samples to identify individuals or relationships between individuals

1.2.6 A representation of the number and structure of all the chromosomes that occur in the nucleus of a somatic cell

1.2.7 A group of similar organisms that are able to interbreed to produce fertile offspring

1.2.8 The phase of meiosis where paired chromosomes are arranged at the equator

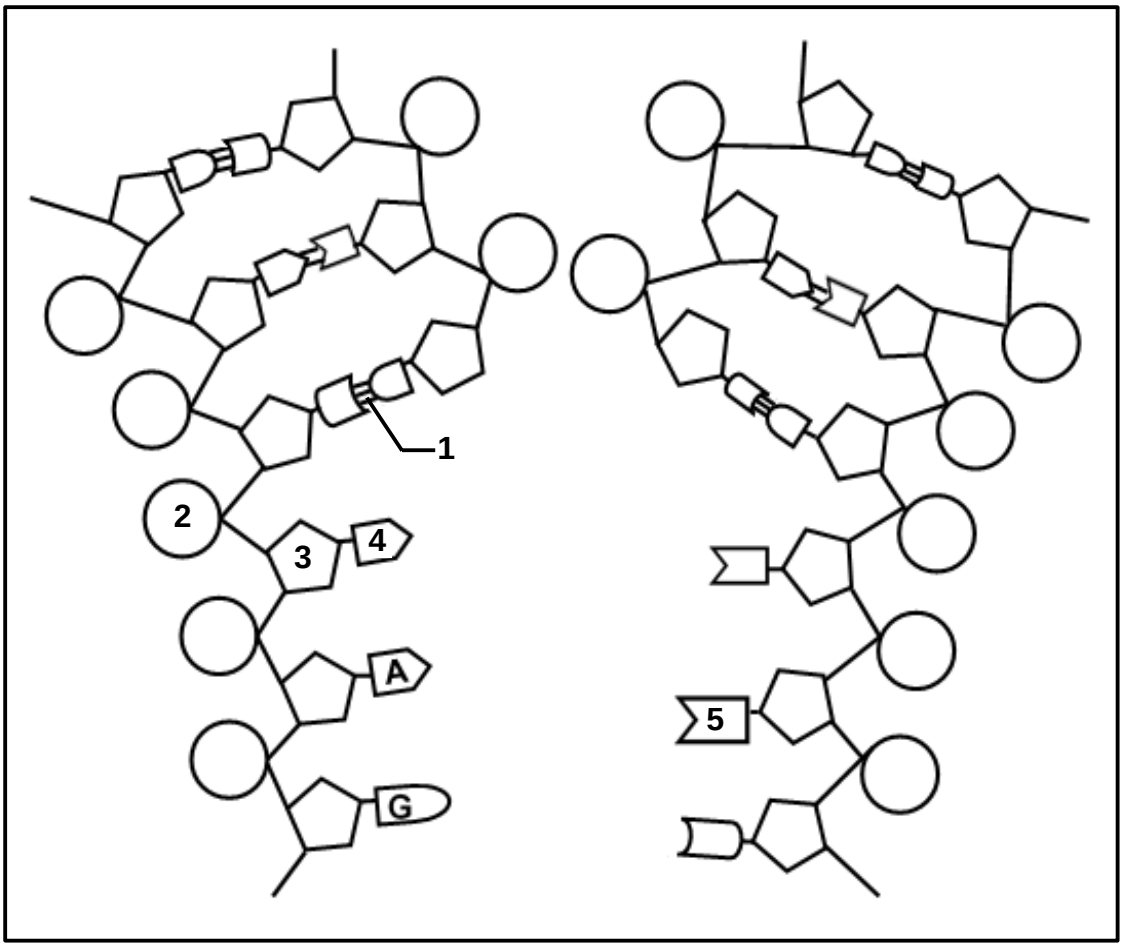
1.2.9 The biotechnological process that produces genetically identical organisms (9 x 1) **(9)**

1.3 Indicate whether each of the descriptions 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	A source of variation in populations	A: Random fertilisation B: Random mating
1.3.2	Discovery of the structure of the DNA molecule	A: Franklin and Wilkins B: Lamarck and Darwin
1.3.3	Occurs during meiosis	A: Karyokinesis B: Cytokinesis

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

1.4 The diagram below represents a DNA molecule undergoing an important biological process.



1.4.1 Identify the:

(a) Process shown in the diagram (1)

(b) Chemical bond labelled **1** (1)

1.4.2 Give the:

(a) Collective name for the parts labelled **2**, **3** and **4** (1)

(b) Full name of the nitrogenous base labelled **5** (1)

1.4.3 During which phase of the cell cycle does this process take place? (1)

1.4.4 Where in the cell does this process occur? (1)
(6)

1.5 In a certain species of butterfly, one gene controls wing-spot colour and another controls eye colour. The wing-spot colour can be red spots (**R**) or grey spots (**r**), while eye colour can be black (**E**) or brown (**e**).

Butterflies that are heterozygous for both genes were crossed.

1.5.1 Name the type of cross represented above. (1)

1.5.2 Give the dominant characteristic of EACH gene. (2)

1.5.3 The table below shows the phenotypes and all the possible genotypes of the offspring.

PHENOTYPES	ALL POSSIBLE GENOTYPES
Red spots, brown eyes	**(X)**
(Y)	RrEe
Grey spots, brown eyes	rree

Give:

(a) ALL the possible genotypes at **X** (4)

(b) The phenotype at **Y** (1)

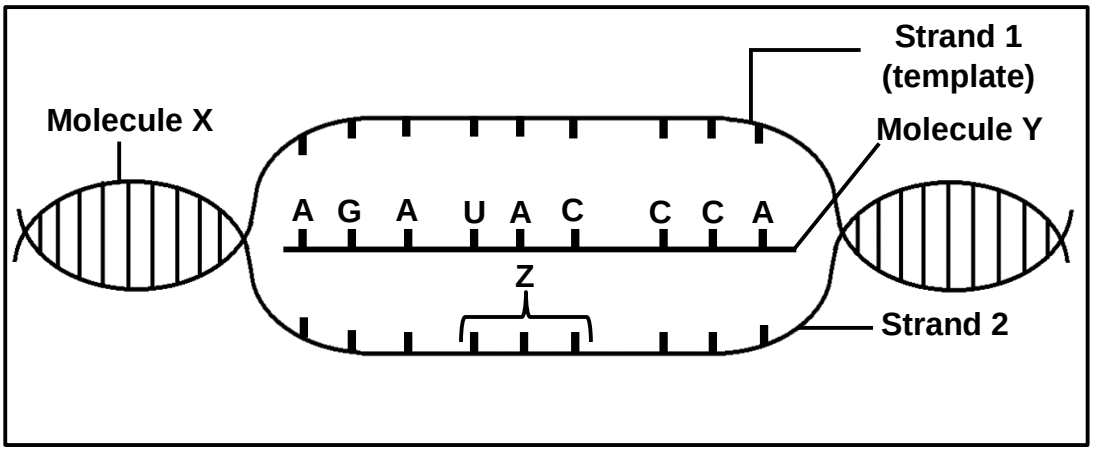
(c) The genotype of the gametes produced by a butterfly with grey spots and brown eyes (1)
(9)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 The diagram below represents a certain stage of protein synthesis. (The sequence of bases is read from left to right.)



2.1.1 Identify molecule **Y**. (1)

2.1.2 Describe the process that resulted in the formation of molecule **Y**. (6)

2.1.3 Give ONE structural difference between molecule **X** and molecule **Y**. (2)

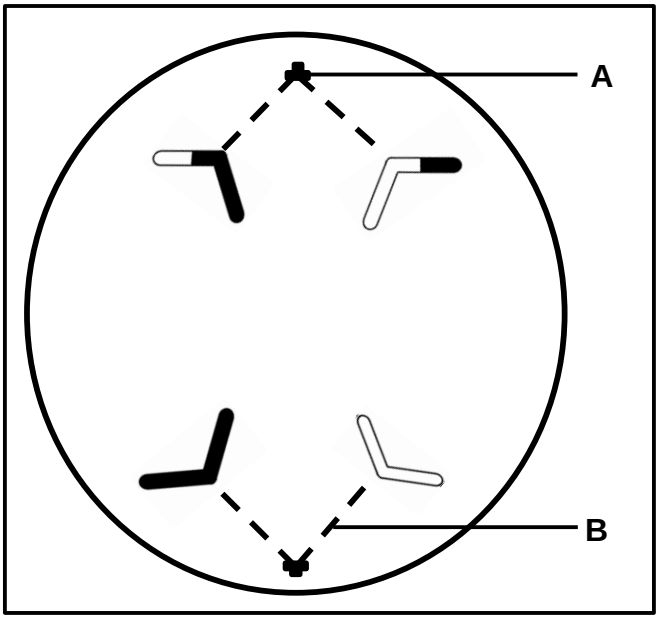
2.1.4 Give the sequence of bases at triplet **Z** on strand **2**. (1)

2.1.5 The table below shows some amino acids coded for by codons on molecule **Y**.

CODON	AMINO ACID
AGA	Arginine
UCU	Serine
CCA	Proline
UAC	Tyrosine
GGU	Glycine

Identify the first and last amino acids coded for by this section of molecule **Y**. (2)
(12)

2.2 The diagram below represents a phase of meiosis **II**.



2.2.1 Identify the phase of meiosis shown. (1)

2.2.2 State ONE difference between the phase shown in the diagram above and the same phase in meiosis **I**. (2)

2.2.3 Identify structure:

(a) **A** (1)

(b) **B** (1)

2.2.4 Describe the role of structure **B** during cell division. (2)

2.2.5 Draw a labelled diagram representing the cell above as it would have appeared in metaphase **II**.

NOTE: The diagram should show the correct shading and include labels (exclude labels for **A** and **B**). (5)
(12)

2.3 The table below shows the percentage of blood donors for each of the blood groups in South Africa for 2018.

BLOOD GROUP	% DONORS
O	48
A	38
B	10
AB	4

2.3.1 According to the data, which is the most common blood group among the donors? (1)

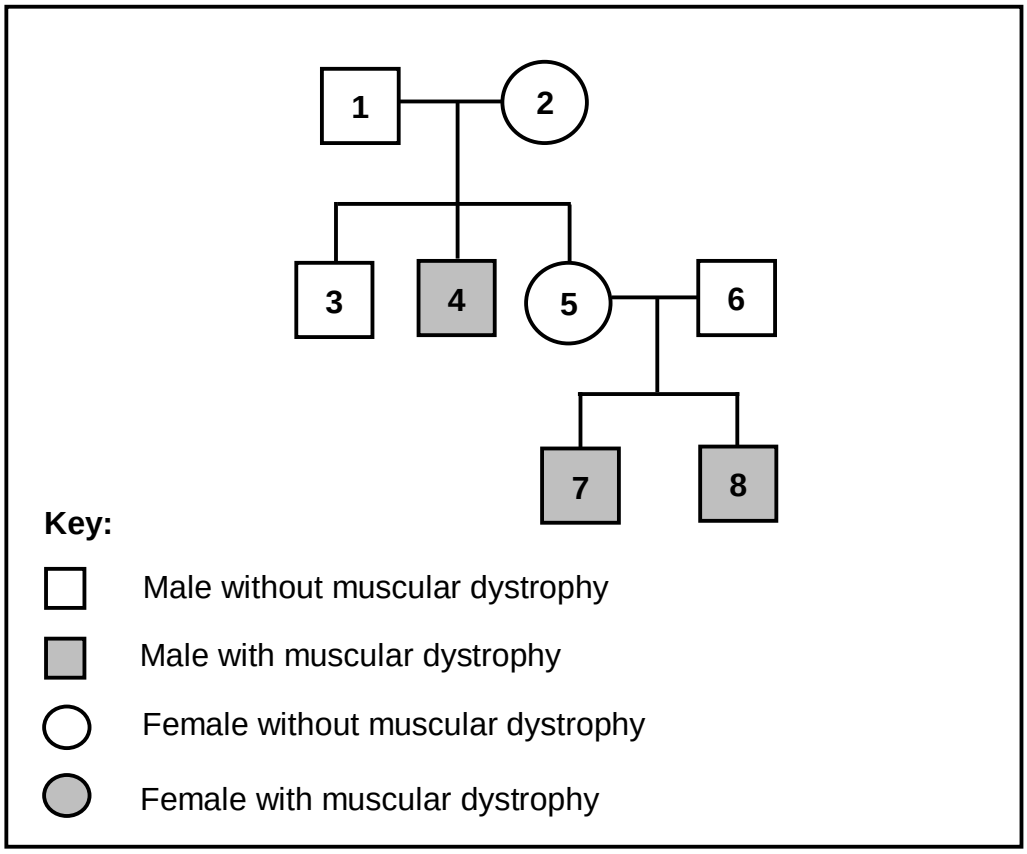
2.3.2 Name the type of dominance shown by the inheritance of blood group **A**. (1)

2.3.3 Explain how it is possible for a man with blood group **A** and a woman with blood group **AB** to have a child with blood group **B**. (5)

2.3.4 Plot a bar graph to represent the data in the table. (6)
(13)

2.4 Muscular dystrophy is a genetic condition that causes muscles to weaken over time. It is caused by a recessive allele on the X chromosome **(X^d)**. The dominant allele (**X^D)** results in normal muscle formation.

The pedigree diagram below shows the inheritance of muscular dystrophy in a family.



2.4.1 How many offspring do individuals **1** and **2** have? (1)

2.4.2 Give the:

(a) Phenotype of individual **1** (1)

(b) Genotype of individual **2** (1)

2.4.3 Explain why more males than females are likely to have muscular dystrophy. (4)

2.4.4 Parents **5** and **6** plan to have another child.

Use a genetic cross to show the percentage chance of having a child with muscular dystrophy. (6)
(13)
[50]

QUESTION 3

3.1 Read the passage below.

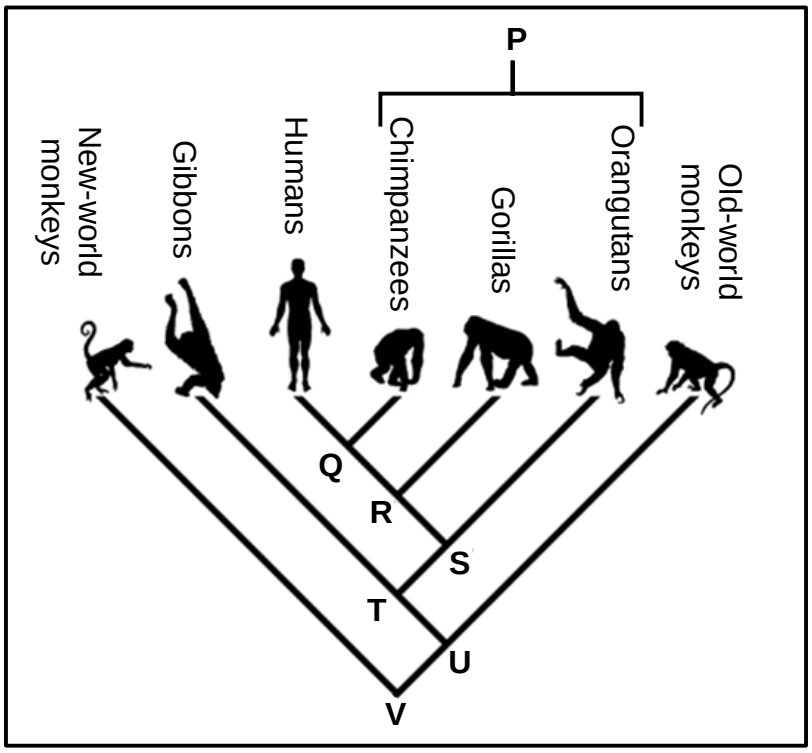
GENETICALLY MODIFIED MAIZE

The bacterium *Bacillus thuringiensis* produces a toxin, called Bt, that kills insects. This bacterium is used to genetically modify maize to contain the Bt toxin. This Bt maize is toxic to insects.

3.1.1 Describe how the Bt maize is genetically modified to be insect resistant. (3)

3.1.2 Explain TWO reasons why farmers might want to grow Bt maize. (4)
(7)

3.2 The phylogenetic tree below shows the evolutionary relationship between some species.



3.2.1 Give the LETTER representing the common ancestor for ALL the species shown in the phylogenetic tree. (1)

3.2.2 Identify the species that is most closely related to Old-world monkeys. (1)

3.2.3 Give a reason for your answer to QUESTION 3.2.2. (1)

3.2.4 Identify THREE species that share the common ancestor **R**. (3)

3.2.5 State THREE characteristics of the upper limbs that humans share with group **P**. (3)
(9)

3.3 A group of researchers conducted an investigation to determine the influence of the type of milk on the height of children drinking the milk. (The investigation was conducted over a period of 7 years from age 3 to age 10).

They:
- Selected 4 146 healthy 3-year-old children of the same race and gender
- Divided the children into two equal groups:
  - One group was given 1 litre of cow's milk to drink daily
  - The other group was given 1 litre of soy milk to drink daily
- Ensured that each group had:
  - The same additional diet
  - Similar daily activities
  - Similar living conditions
- Provided the milk from the same supplier
- Measured the children's height at the end of the investigation and calculated the average

The table below shows the results at the end of the investigation compared to the expected average height of 10-year-olds.

EXPECTED AVERAGE HEIGHT OF CHILD (cm)	**AVERAGE HEIGHT OF A CHILD ON COW'S MILK (cm)**	**AVERAGE HEIGHT OF A CHILD ON SOY MILK (cm)**
149,86	151,4	147,4

3.3.1 Identify the:

(a) Independent variable (1)

(b) Dependent variable (1)

3.3.2 Name the type of variation displayed by the height of a person. (1)

3.3.3 State TWO planning steps that the researchers had to consider at the beginning of this investigation. (2)

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

3.3.5 State ONE factor that could have negatively affected the validity of this investigation. (1)

3.3.6 How did the researchers ensure the reliability of the results? (1)

3.3.7 State the conclusion for this investigation. (2)
(12)

3.4 The passage below describes *Homo erectus* fossils.

> Evidence from fossils of *Homo erectus* shows that they appeared in Africa about 2 million years ago. They spread to many parts of Asia. *Homo erectus* is the oldest known species to be fully bipedal and have a human-like body. Their brain size was smaller than that of humans today. A prominent brow ridge was present over their eye sockets.

3.4.1 Describe how the fossils of *Homo erectus* are used to support the 'Out-of-Africa' hypothesis. (3)

3.4.2 Describe how all OTHER fossil evidence is used to support the 'Out-of-Africa' hypothesis. (4)

3.4.3 Use the information in the passage regarding *Homo erectus* and tabulate TWO differences between the features of *Homo erectus* and *Homo sapiens*. (5)

3.4.4 What observation of the skull of *Homo erectus* would have led scientists to conclude that *Homo erectus* was bipedal? (1)
(13)

3.5 Read the passage below.

> **NATURAL SELECTION IN WOLVES**
>
> In 1986 there was a huge radioactive disaster in Chernobyl and all humans immediately left the area because of the deadly high radiation. Animals exposed to this high radiation developed cancer or died. Almost 40 years later, scientists have been studying the wolves that live in this highly radioactive environment where they are exposed to high radiation. They found that these wolves have a mutation that makes them immune to cancer.

3.5.1 What is a *mutation*? (1)

3.5.2 What effect does exposure to high radiation have on animals? (1)

3.5.3 Use Darwin's theory of natural selection to explain the development of immunity to cancer in these wolves. (7)
(9)
[50]

TOTAL SECTION B: 100
GRAND TOTAL: 150

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NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES P2

NOVEMBER 2024

MARKING GUIDELINES

MARKS: 150

These marking guidelines consist of 11 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 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 national standardisation 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. The marking guideline 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.

19. **Changes to the marking guideline**
No changes must be made to the marking guidelines. The provincial internal moderator must be consulted, who in turn will consult with the national internal moderator (and the Umalusi moderators where necessary).

20. **Official marking guidelines**
Only marking guidelines bearing the signatures of the national internal moderator and the Umalusi moderators and distributed by the National Department of Basic Education via the provinces must be used.

SECTION A

QUESTION 1

1.1	1.1.1	A✓✓		
	1.1.2	C✓✓		
	1.1.3	C✓✓		
	1.1.4	B✓✓		
	1.1.5	D✓✓		
	1.1.6	B✓✓		
	1.1.7	D✓✓		
	1.1.8	C✓✓		
	1.1.9	C✓✓		
	1.1.10	C✓✓	(10 x 2)	**(20)**
1.2	1.2.1	Deoxyribonucleic acid✓/DNA		
	1.2.2	Haploid✓		
	1.2.3	Centromere✓		
	1.2.4	transfer RNA✓/tRNA		
	1.2.5	DNA profiling✓		
	1.2.6	Karyotype✓/karyogram		
	1.2.7	Species✓		
	1.2.8	Metaphase I✓/1		
	1.2.9	Cloning✓	(9 x 1)	**(9)**
1.3	1.3.1	Both A and B✓✓		
	1.3.2	A only✓✓		
	1.3.3	Both A and B✓✓	(3 x 2)	**(6)**
1.4	1.4.1	(a) (DNA) replication✓		(1)
		(b) Hydrogen✓bond		(1)
	1.4.2	(a) Nucleotide✓		(1)
		(b) Thymine✓		(1)
	1.4.3	Interphase✓		(1)
	1.4.4	Nucleus✓		(1)
				(6)
1.5	1.5.1	Dihybrid✓ cross		(1)
	1.5.2	Red spots✓ and black eyes✓		(2)
	1.5.3	(a) RRee✓✓ and Rree✓✓		(4)
		(b) Red spots, black eyes ✓		(1)
		(c) re✓		(1)
				(9)
			TOTAL SECTION A:	**50**

SECTION B

QUESTION 2

2.1 2.1.1 mRNA✓/messenger RNA (1)

2.1.2
- 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 complements U, G complements C

Any (6)

2.1.3
- Molecule **X** (DNA) is double stranded✓(double helix)
- Molecule **Y** (RNA) is single stranded✓

OR

- Molecule **X** (DNA) has H-bonds✓
- Molecule **Y** (RNA) has no H-bonds✓

OR

- Molecule **X** (DNA) contains deoxyribose✓sugar
- Molecule **Y** (RNA) contains ribose✓sugar

OR

- Molecule **X** (DNA) has thymine✓/T as a nitrogenous base
- Molecule **Y** (RNA) has uracil✓/U as a nitrogenous base

OR

- Molecule **X** (DNA) is longer✓
- Molecule **Y** (RNA) is shorter✓

(Mark first ONE only) Any (1 x 2) (2)

2.1.4 TAC✓ (1)

2.1.5
- Arginine✓
- Proline✓

(2)
(12)

2.2 2.2.1 Anaphase II✓ (1)

2.2.2
- Chromosome pairs separate during Anaphase I✓/ chromosomes move to the poles
- A chromosome separates during Anaphase II✓/chromatids move to the poles

OR

- Centromeres do not split during Anaphase I✓
- Centromeres split during Anaphase II✓

(Mark first ONE only) Any (1 x 2) (2)

2.2.3 (a) Centriole✓/centrosome (1)

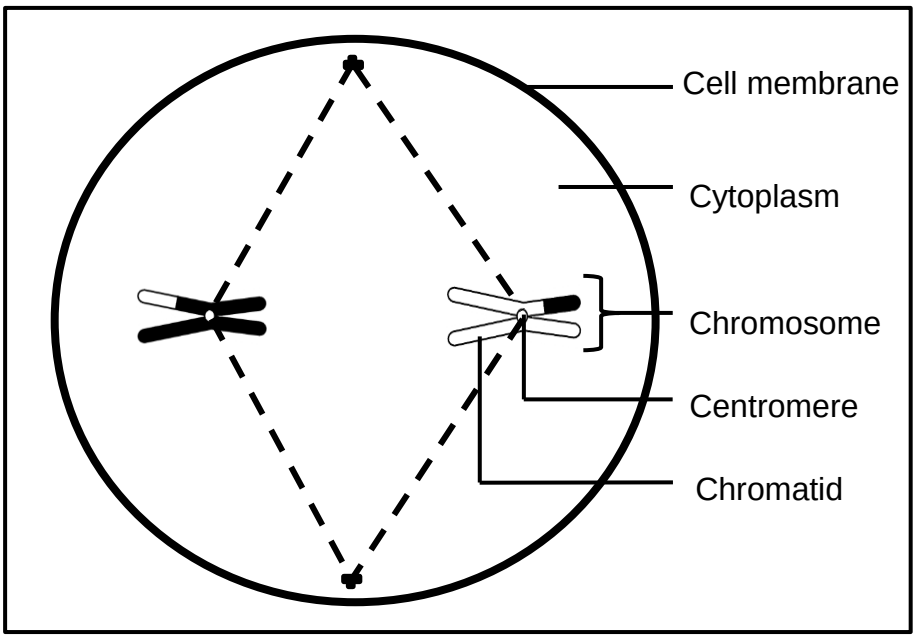
(b) Spindle fibre✓ (1)

2.2.4
- Attaches to the centromere✓
- to pull chromatids/chromosomes towards the (opposite) poles✓

OR

- it contracts✓/shortens
- to pull chromatids/chromosomes towards the (opposite) poles✓ (2)

2.2.5 **Diagram showing metaphase II**



Guideline for assessing the drawing

Criteria		Marks
Position: chromosomes in a single row at the equator	(**P**)	1
Number: 2 unpaired chromosomes drawn	(**N**)	1
Shading of chromosomes [1 shaded chromosome with an unshaded tip 1 unshaded chromosome with a shaded tip]	(**S**)	1
Any **TWO** correct labels (except centriole & spindle fibre)	(**L**)	2

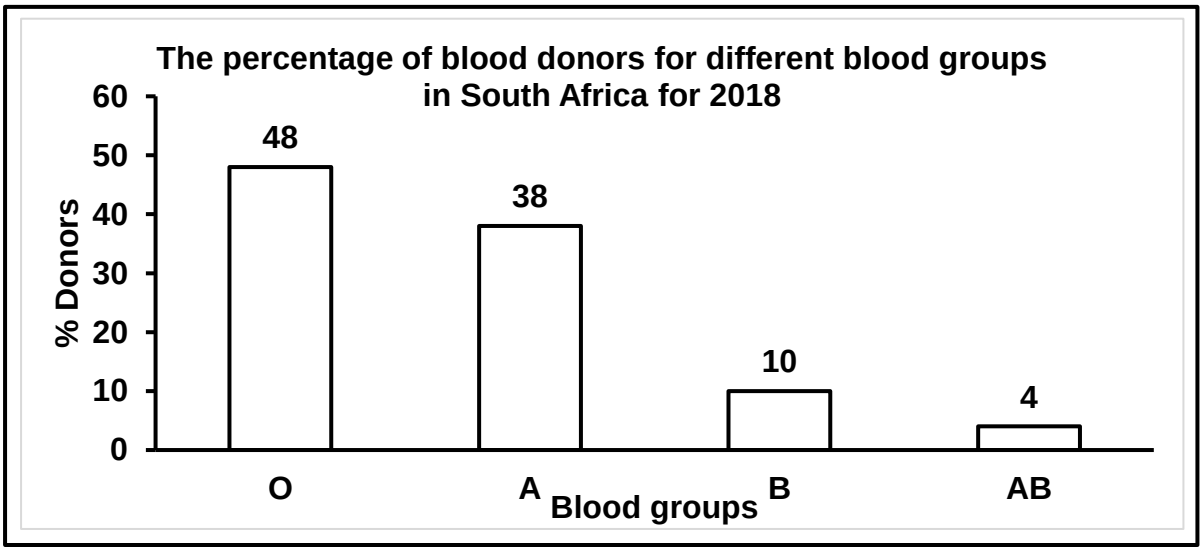
(5)
(**12**)

2.3 2.3.1 O✓ (1)

2.3.2 Complete✓dominance (1)

2.3.3
- The man is heterozygous✓ /is I^Ai for blood group A
- The woman has an allele for blood group B✓/is I^AI^B
- The child inherits the I^B allele from the mother✓
- and the i allele from the father✓
- Therefore, the child will be heterozygous✓ for blood group B/ the genotype will be I^Bi (5)

2.3.4



Guideline for assessing the graph

CRITERIA		ELABORATION	MARK
Correct type of graph	**(T)**	Bar graph drawn	1
Caption of graph	**(C)**	Both variables, SA and 2018 included	1
Axes labels	**(L)**	X- and Y axis correctly labelled with units	1
Scale for X- and Y-axis	**(S)**	- Equal space and width of bars for X-axis and - Correct scale for Y-axis	1
Plotting of co-ordinates	**(P)**	- 1 to 3 co-ordinates plotted correctly - All 4 co-ordinates plotted correctly	1 2

Histogram or line graph drawn (6)
- Lose marks for type of graph and for scale **(13)**

Transposed axes:
- Can get full credit, if axes labels are also swapped and bars are horizontal
- If labels are *not* corresponding, then lose marks for labels and scale
- Check that the plotting is correct for the given labels

2.4 2.4.1 Three✓/3 (1)

2.4.2 (a) Male without muscular dystrophy✓ (1)

(b) X^DX^d✓ (1)

2.4.3
- Males only have one X chromosome✓/XY and
- need only one recessive allele to have muscular dystrophy✓
- The X^d allele on a male cannot be masked by a dominant allele✓
- Females have two X-chromosomes✓ and
- need two recessive alleles to have muscular dystrophy✓/ X^dX^d
- In females, a dominant allele on one X chromosome would mask the effect of the recessive allele✓/X^D masks X^d Any (4)

2.4.4

P_2	Phenotype	Female without muscular dystrophy	x	Male without muscular dystrophy✓
	Genotype	X^DX^d	x	X^DY✓

Meiosis

	Gametes	X^D, X^d	x	X^D, Y✓

Fertilisation

F_2	Genotype	$X^D X^D$	$X^D Y$,	$X^D X^d$,	X^dY ✓

Phenotype
(50%) females without muscular dystrophy
(25%) male without muscular dystrophy
(25%) male with muscular dystrophy ✓

25✓***%** chance of muscular dystrophy child

P_2 and F_2✓
Meiosis and fertilisation✓

***1 compulsory mark** + Any 5

OR

P_2	Phenotype	Female without muscular dystrophy	x	Male without muscular dystrophy✓
	Genotype	X^DX^d	x	X^DY✓

Meiosis

Fertilisation

Gametes	X^D	X^d
X^D	$X^D X^D$	$X^D X^d$
Y	$X^D Y$	X^dY

1 mark for correct gametes
1 mark for correct genotypes

F_2 Phenotype
(50%) females without muscular dystrophy
(25%) male without muscular dystrophy
(25%) male with muscular dystrophy ✓

25✓***%** chance of muscular dystrophy child

P_2 and F_2✓
Meiosis and fertilisation✓

***1 compulsory mark** + Any 5 (6)
(13)
[50]

QUESTION 3

3.1	3.1.1	- The Bt producing gene is cut from the bacterial DNA✓ and - inserted into maize DNA✓ - This recombinant DNA✓ - causes the maize plant to produce the Bt toxin✓	Any	(3)
	3.1.2	- Fewer crops damaged✓ leads to increased yield✓/more food for people/increased food security/healthier crops/more profit - Reduced need for pesticides,✓ farmers save money✓/less toxins to consumers/environment **(Mark first TWO only)**	(2 x 2)	(4) **(7)**
3.2	3.2.1	V✓		(1)
	3.2.2	Gibbons✓/U		(1)
	3.2.3	<u>For gibbons at 3.2.2</u> They share the most recent common ancestor U✓ **OR** <u>For 'U' at 3.2.2</u> Old-world monkeys are directly descended from U✓		(1)
	3.2.4	Humans✓ Chimpanzees✓ Gorillas✓ Q✓ **(Mark first THREE only)**	Any	(3)
	3.2.5	- (Freely) rotating arms✓ - Long upper arms✓ - Rotation around the elbow joints✓ - Rotation around the wrist✓ - Bare fingertips✓ - Nails instead of claws✓ - Have fingerprints✓ - Opposable thumb✓/Precision grip - Five digits per limb✓/Pentadactyl hand **(Mark first THREE)**	Any	(3) **(9)**
3.3	3.3.1	(a) Type of milk✓		(1)
		(b) Height✓ of children		(1)
	3.3.2	Continuous✓ (variation)		(1)

3.3.3
- Ensure the same additional diet✓
- Ensure similar daily activities✓
- Ensure similar living conditions✓
- Date✓ /time/ venue for measurement
- Decide on the sample size✓
- Ask for parental consent✓
- Train the research assistants✓
- Recruit parents that are willing to participate✓
- Decide on the target group✓
- Design the recording sheet✓
- Decide on the source of milk✓
- Select apparatus✓ /equipment/decide on method measurement
- Decide on duration✓ of investigation
- Choosing the type of milk✓
- Decide on the amount of milk✓ Any (2)

(Mark first TWO only)

3.3.4
- Only healthy children✓ chosen

Same:
- age✓
- race✓
- gender✓
- quantity of milk✓
- additional diet✓
- supplier of milk✓
- number of children in each group✓
- duration✓

Similar:
- daily activities✓
- living (environmental) conditions✓ Any (3)

(Mark first THREE only)

3.3.5
- Genetic/hormonal influence was not considered✓
- Difficult to maintain the same conditions over a 7-year period✓
- Not measuring the baseline height✓ Any (1)

(Mark first ONE only)

3.3.6
- 2 073 children in each group✓ participated
- 4 146 children divided into two equal groups✓ participated
- Investigation conducted over 7 years✓ Any (1)

3.3.7 Cow milk consumption leads to better growth/increased height compared to soy milk✓✓

OR

Soy milk consumption by children leads to decreased height✓✓/ below average height

OR

Cow-milk consumption by children leads to increased height✓✓/ above average height (2)

(12)

3.4 3.4.1
- The oldest fossils of *Homo erectus* were found in Africa✓, while
- the younger fossils were found in other parts of the world✓/Asia
- indicating that *Homo erectus* migrated out of Africa✓ (3)

3.4.2
- *Ardipithecus* fossils were found in Africa only✓
- *Australopithecus* fossils were found in Africa only✓
- Fossils of *Homo habilis* were found in Africa only✓
- The oldest fossils of *Homo sapiens* were found in Africa✓
- The younger fossils of *Homo sapiens* were found in other parts of the world✓ Any (4)

3.4.3

Homo erectus	***Homo sapiens***
Small brain✓	Large brain✓
Prominent brow ridges✓	Reduced brow ridges✓

(Mark first TWO) (2 x 2) + (1) table ✓ (5)

3.4.4 The foramen magnum was in a (more) forward position✓ (1)
(13)

3.5 3.5.1 Changes in the genetic composition✓ of organisms (1)

3.5.2 Leads to cancer✓/death/mutations (1)

3.5.3
- There was variation amongst (the population of) the wolves✓
- Some had the mutation which made them immune to cancer and some did not✓
- When exposed to radiation✓
- the wolves without the mutation/immunity died✓
- Those with the mutation/ immunity survived✓
- and reproduced✓
- passing the allele for the mutation/ immunity to their offspring✓
- The next generation had a higher proportion of wolves with the mutation✓/immunity to cancer Any (7)

(9)
[50]

TOTAL SECTION B: 100
GRAND TOTAL: 150