basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

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)

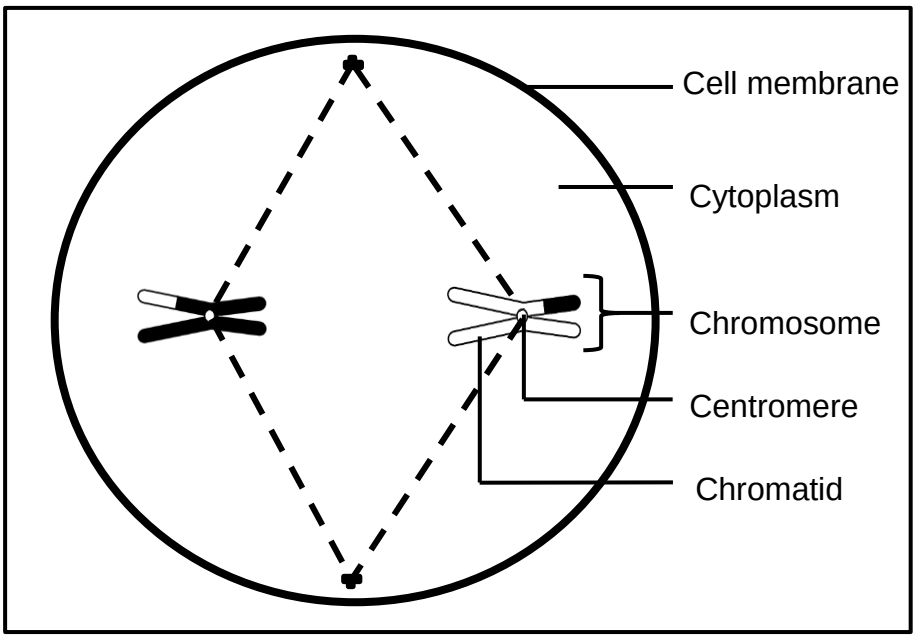
(b) Spindle fibre✓ (1)

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

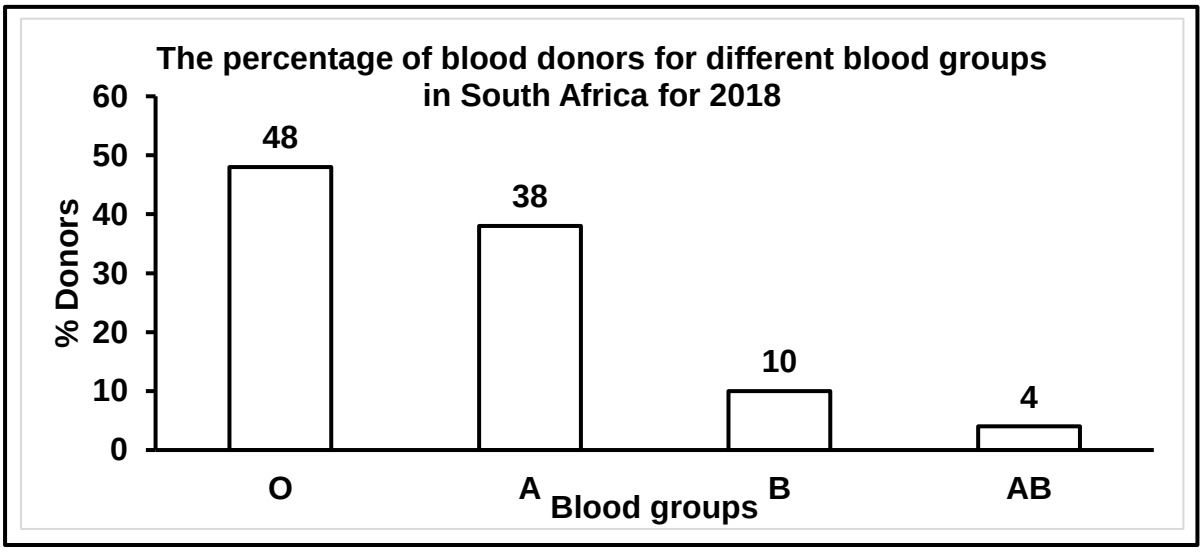
(5)
(**12**)

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