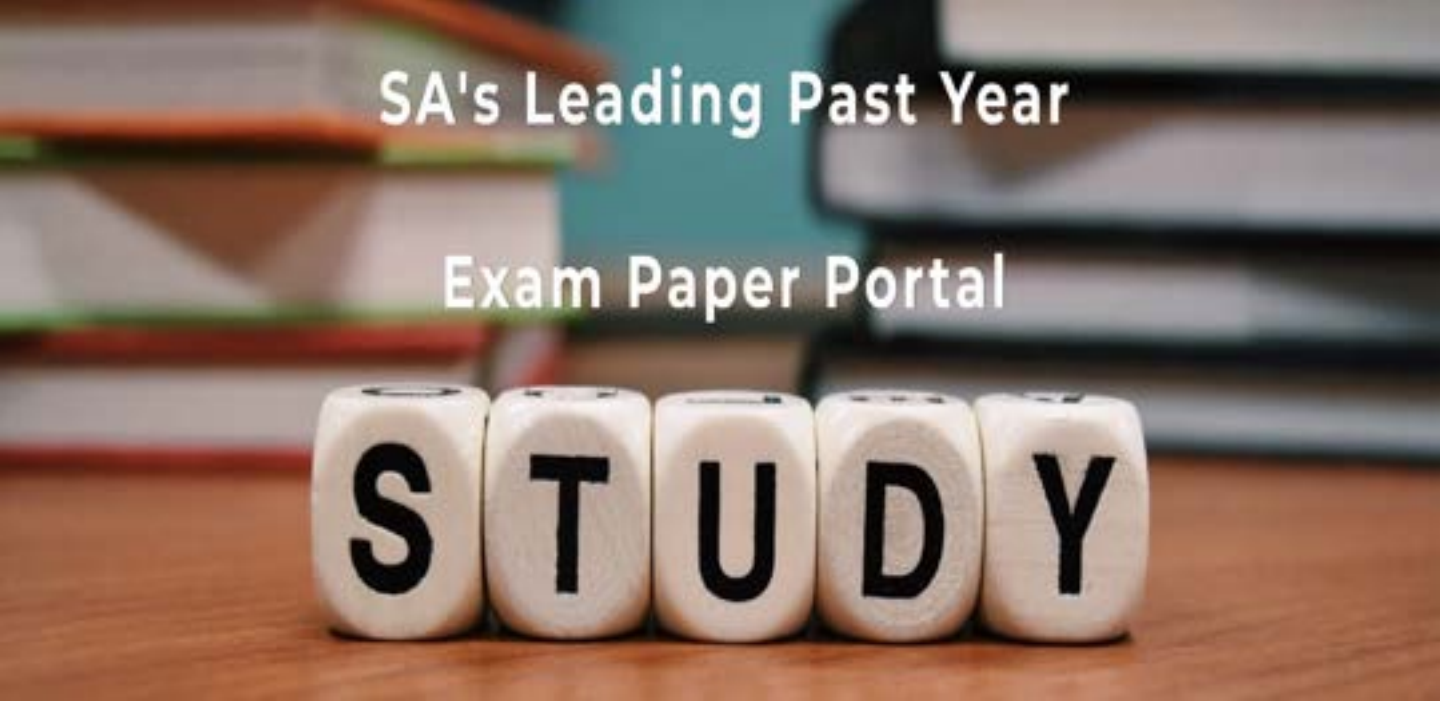

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PREPARATORY EXAMINATION 2022

MARKING GUIDELINES

LIFE SCIENCES PAPER 2 (10832)

14 pages

PRINCIPLES RELATING TO THE MARKING OF LIFE SCIENCES

1. **If more information than marks allocated is given**
   Stop marking when maximum number of marks is reached and place a wavy line and 'max' in the right-hand margin.

2. **If, for example, three reasons are required and five are given**
   Mark only 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 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 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 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, provided it does not mean something else in Life Sciences or if it is out of context**.**

13. **If common names are given in terminology**
    Accept, provided it was accepted at the memo discussion meeting.

14. **If only letter is asked for and only name is given (and vice versa)**
    No 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 to the marking guidelines**
    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	B ✓✓		
	1.1.3	C ✓✓		
	1.1.4	D ✓✓		
	1.1.5	A ✓✓		
	1.1.6	C ✓✓		
	1.1.7	A ✓✓		
	1.1.8	C ✓✓	(8 x 2)	**(16)**
1.2	1.2.1	Incomplete ✓dominance		
	1.2.2	Chiasma ✓/chiasmata		
	1.2.3	Nucleotide ✓		
	1.2.4	Foramen magnum ✓		
	1.2.5	Colour-blindness ✓		
	1.2.6	Homozygous ✓		
	1.2.7	Karyotype ✓ /Karyogram	(7 x 1)	**(7)**
1.3	1.3.1	B only ✓✓		(2)
	1.3.2	None ✓✓		(2)
	1.3.3	Both A and B ✓✓		(2) **(6)**
1.4	1.4.1	Nucleus ✓ Ribosome ✓		(2)
	1.4.2	Three✓/3		(1)
	1.4.3	Peptide ✓ bond		(1)
	1.4.4	GGU ✓		(1) **(5)**

1.5	1.5.1	Codominance ✓	(1)
	1.5.2	BW ✓ /WB	(1)
	1.5.3	1 black and white : 1 black Mark for correct phenotypes (P) ✓ Mark for correct ratio (R) ✓ **Do not accept % – ratio asked**	(2) **(4)**
1.6	1.6.1	Dihybrid ✓	(1)
	1.6.2	(a) Bbrr ✓✓ (b) BR and bR ✓✓ / BR, BR, bR, bR	(2) (2)
	1.6.3	Species-specific courtship behaviour ✓	(1) **(6)**
1.7	1.7.1	Cultural ✓evidence	(1)
	1.7.2	<u>Homo sapiens</u> ✓ (Learners must underline scientific name to get the mark. Capital 'H' for Homo genus and lower case 's' for sapien species)	(1)
	1.7.3	*Homo habilis*✓/*H. habilis* *Homo erectus*✓/*H. erectus*	(2)
	1.7.4	Acheulian ✓ /Mousterian	(1)
	1.7.5	Mousterian ✓	(1) **(6)**
		TOTAL SECTION A:	**50**

SECTION B

QUESTION 2

2.1 2.1.1 C and D ✓ (1)

2.1.2 The soldier inherits half of his DNA from his mother and half from his father. ✓
The DNA bars/black bands/black bars of the dead soldier are a combination of the DNA bars/black bands/black bars of parents C and D. ✓ (2)

2.1.3
- identification of criminals ✓/forensic evidence
- identification of genetic disorders ✓
- developing cures for genetic disorders ✓
- tissue type for organ transplant ✓

Mark FIRST ONE only.

Candidates may not use identification of dead body OR paternity OR identification of relatives as these are in the question. (1)
(4)

2.2 2.2.1 Inter ✓ (phase) (1)

2.2.2 (Gene) Mutation ✓ (1)

2.2.3 G-G ✓ (1)

2.2.4
- incorrect nitrogenous base sequence results in different DNA strand ✓/ abnormal strand
- will result in wrong genetic code ✓ for daughter cells formed/ wrong/nonsense/different proteins could be formed (2)

2.2.5 Table showing differences between DNA replication and transcription

DNA replication	Transcription
A whole DNA molecule used ✓	A part (gene) of the DNA unwinds exposing the gene ✓
An (identical) DNA molecule is formed ✓ /double strand of DNA	An mRNA molecule is formed ✓ / single strand of RNA
Important for cell division/mitosis/ meiosis ✓	Important for protein synthesis ✓
Both strands of DNA act as templates ✓	One strand of DNA acts as a template ✓
DNA nucleotides are used ✓	RNA nucleotides are used ✓
Adenine bonds with thymine ✓	Adenine bonds with uracil ✓

Any TWO comparisons + correct table format (T ✓) (5)
Mark first TWO only

(10)

2.3 2.3.1 2 – glycine ✓
4 – alanine ✓ (2)

2.3.2 Three ✓/3 OR four/4 (1)

2.3.3 **Translation ✓ ***

– 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 ✓

1 compulsory* + any 4 (5)
(8)

2.4. 2.4.1 Anaphase ✓ I/1/II /2 (1)

2.4.2 (a) 2 ✓ (1)
(b) Two ✓/2 (1)

2.4.3 Paternal ✓/father
Maternal ✓/mother (2)

2.4.4

Diagram of a cell in metaphase II

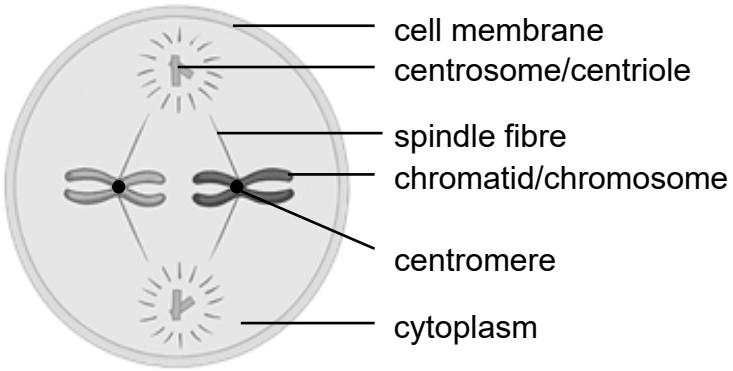
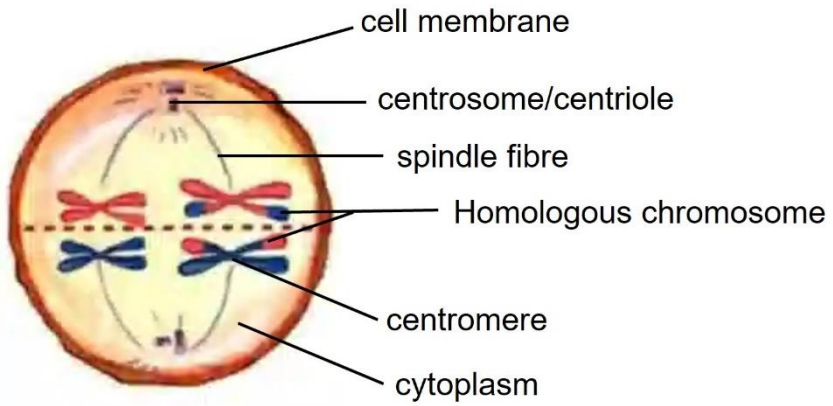


Diagram of a cell in metaphase I



Note: The diagram in 2.4.4 must correlate to the learner's answer in 2.4.1.
If 2.4.1. anaphase I/1 then 2.4.4 diagram of metaphase I/1
If 2.4.1. anaphase II/2 then 2.4.4 diagram of metaphase II/2

Criteria	**Marks**
Caption **(C)**	1
Correct drawing phase **(P)**	1
Any TWO labels **(L)**	2
TOTAL	**4**

(4)

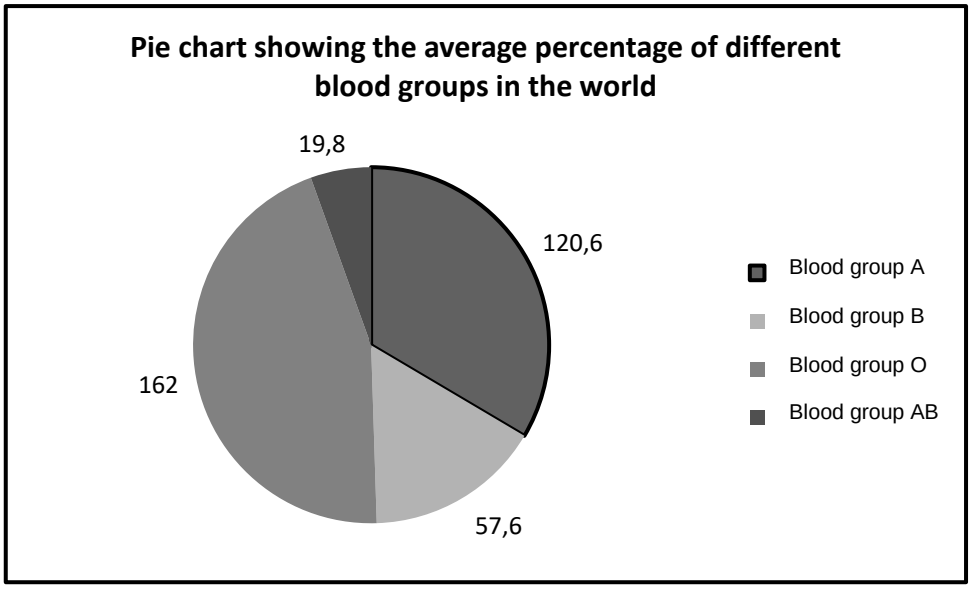
2.4.5 22 ✓ (1)

(10)

2.5 2.5.1 (a) Three ✓/3 (1)
(b) One ✓/1 (1)

2.5.2 AB ✓ (1)

2.5.3



Calculations			
Total = 100			
Blood group A	Blood group B	Blood group O	Blood group AB
= $\frac{33,5}{100}$ x 360 = 120,6°	= $\frac{16,0}{100}$ x 360 = 57,6°	= $\frac{45,0}{100}$ x 360 = 162°	= $\frac{5,5}{100}$ x 360 = 19,8°

Rubric for the mark allocation of the pie chart

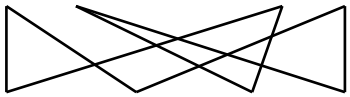
Heading: (**H**)	Both variables included	1
Type: (**T**)	Circle drawn with a compass and four segments shown by lines from centre to circumference	1
Plot: (**P**)	1 – 2 segments plotted accurately 3 - 4 segments plotted accurately	1 2
Calculations: (**C**)	1 – 3 calculations correct All calculations correct	1 2
	TOTAL	**6**

NOTE: If the wrong type of graph is drawn, marks will be lost for "correct type of graph" as well as for drawing the slices in correct proportions.

(6)
(9)

2.6 2.6.1 (a) nn ✓ (1)
(b) Nn ✓ (1)

2.6.2 Law of dominance ✓ (1)

2.6.3 **P_1** Phenotype Spotted fur x striped fur ✓
Genotype Nn x nn ✓
Meiosis
G/gametes N , n x n , n ✓
Fertilisation 
F_1 Genotype Nn Nn nn nn ✓
1 Nn : 1 nn ✓

F_1 Phenotype 2 spotted fur : 2 striped fur * ✓ OR
1 spotted fur : 1 striped fur
*** Compulsory mark**
P_1 and F_1 ✓
Meiosis and fertilisation ✓
***Compulsory 1** + any 5

OR

P_1 Phenotype Spotted fur x striped fur ✓
Genotype Nn x nn ✓

Meiosis

Fertilisation

Gametes	N	n
n	Nn	nn
n	Nn	nn
1 mark for correct gametes ✓ **1 mark for correct genotypes** ✓		

F_1 Genotype Nn Nn nn nn ✓
1 Nn : 1 nn ✓

F_1 Phenotype 2 spotted fur : 2 striped fur * ✓ OR
1 spotted fur : 1 striped fur
*** Compulsory mark**
P_1 and F_1 ✓
Meiosis and fertilisation ✓
***Compulsory** 1 + Any 5

(6)
(9)
[50]

QUESTION 3

3.1 3.1.1 Most of the family are affected ✓/have Rett syndrome / all females (1,4 and 6) have Rett syndrome / even the heterozygous are affected. (1)

3.1.2 5 ✓ (1)

3.1.3 **To explain the males probability:**

- Only have one X-chromosome ✓
- Either have the recessive allele thus unaffected ✓
- Or has dominant allele thus affected ✓
- Only a 50% chance of being affected ✓ Any TWO (2)

To explain the females probability:

- Have two X chromosomes ✓
- Have a 75% chance of being affected ✓
- Whether she is homozygous dominant ✓/X^R X^R
- or heterozygous ✓/X^R X^r Any TWO (2)

3.1.4 (a) 100 ✓ (1)
(b) X^RX^r ✓ (1)
(8)

3.2 3.2.1 (a) Claw size ✓ (1)
(b) Mating success ✓ (1)

3.2.2 Three investigations ✓were conducted./The investigation was repeated three times / used large sample size / used 15 crabs (1)

3.2.3 Use the same species/type of crab ✓
Same number of male and female crabs ✓
Same cage ✓
Mark first TWO only. (2)

3.2.4 Wear protective clothing ✓/gloves to protect against nipping from claws ✓
Provide appropriate habitat for crabs with sufficient food ✓/water/ shelter to ensure crab survival ✓
Mark first ONE only. (2)

3.2.5 **According to the law of use and disuse ✓:**

- All the male fiddler crabs had short claws ✓ originally
- The male fiddler crabs frequently waved ✓their claws more,
- To attract females to reproduce ✓
- The claws eventually became bigger ✓
- The bigger claw acquired in this way was then passed on to the next generation ✓
- Eventually all the male fiddler crabs had a large claw. ✓

Any four (4)
(11)

3.3. 3.3.1 Recessive dwarf mutation ✓ (must be full answer for mark allocation) (1)

3.3.2 (a) The sheep jumped over fences✓/got lost/ran away/loss of sheep/ loss of revenue (1)

(b)
- Less damage to fences ✓ so reduces the need for tall fences ✓/saves money/spends less on fence repairs.
- Short legs limited the sheep's ability to run,✓ they were less active thus reducing the number of lost sheep. ✓
- Less money and time wasted, ✓ less need to locate sheep that jumped over the fences. ✓
- Sheep are safer, ✓less stock loss to predators. ✓

Cause and effect any ONE (1 x 2 = 2) (2)

3.3.3 The intentional breeding of individuals ✓ by humans ✓ in a population to achieve a desirable phenotype ✓/desirable trait. (2)
Any TWO **(6)**

3.4 3.4.1 (a) Longer ✓ jaw (1)
(b) Frog ✓/mice/ small prey (1)

3.4.2 (a) A group of organisms with similar characteristics that can interbreed ✓ and produce fertile offspring. ✓ (2)

(b) Possibility of how speciation could occur:

- The population of tiger snakes could become **separated by the sea ***✓
- the population splits into two ✓
- There will be no gene flow between the two populations. ✓
- Since each population may be exposed **to different diets/prey sizes** *✓
- natural selection could occur independently in each of the two populations ✓
- such that the individual species of the two populations become very different from each other ✓
- genotypically and phenotypically. ✓
- Even if the two populations were to mix again, ✓
- they will not be able to interbreed. ✓
- The two populations are now different species.

TWO compulsory marks* Any other FIVE points (7)
(11)

3.5 3.5.1
- Evolution takes long periods of time ✓
- where very little ✓/gradual/no change occurs (known as equilibrium).
- This alternates with (is punctuated by) short periods of time ✓
- where rapid change occurs. ✓
- **through natural selection ✓***

1 compulsory mark + any 3 points (4)

3.5.2 B to C ✓ (1)

3.5.3 No ✓ (1)
(6)

3.6 3.6.1 (a) Larger ✓ (temporal muscle attaches to a larger jaw) which increases the ability to chew harder food✓/bite power (2)

(b) Larger teeth ✓/Canines increase the ability to rip and tear tough raw food ✓ (2)

3.6.2 (Skull) B ✓ (1)

3.6.3 Large brain ✓
Eyes in front ✓
Binocular vision ✓ /stereoscopic vision
Eyes with cones ✓ / colour vision
Freely rotating arms ✓
Long/er upper arms ✓
Rotation around elbow joints ✓
Five fingers ✓ per hand
Bare fingertips or nails instead of claws ✓
Opposable thumb ✓
Upright posture ✓
Sexual dimorphism ✓
Two mammary glands ✓

Mark FIRST THREE only (3)
(8)
[50]

TOTAL SECTION B: 100

TOTAL: 150