



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 ✓✓	(2)
		(b) BR and bR ✓✓ / BR, BR, bR, bR	(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	<i>Homo habilis</i> ✓ / <i>H. habilis</i> <i>Homo erectus</i> ✓ / <i>H. erectus</i>	(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

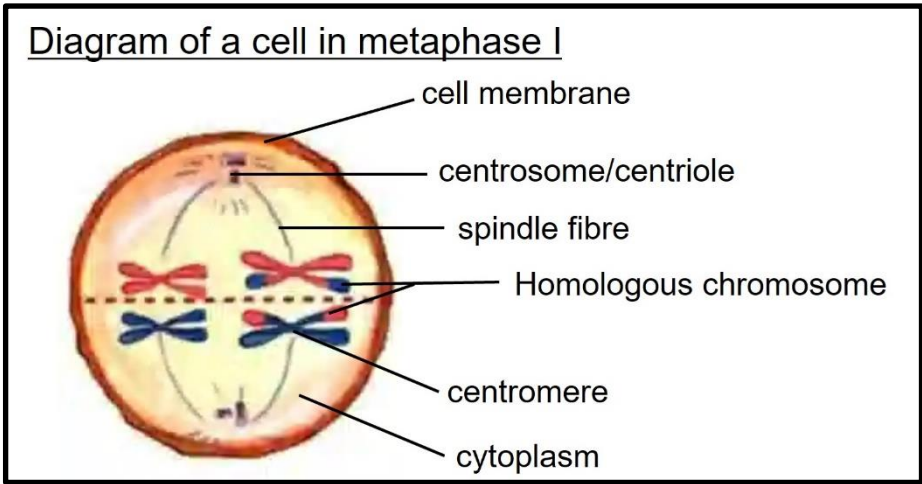
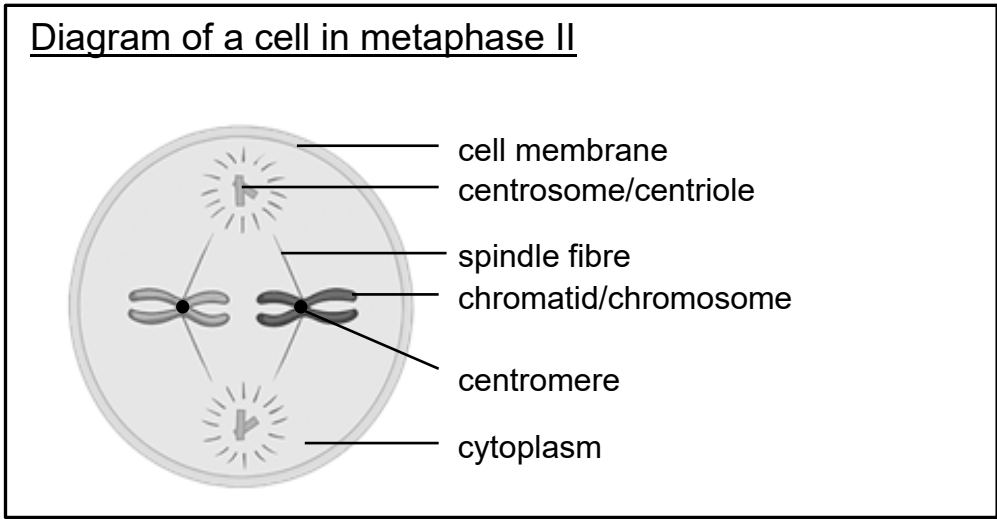
DNA replication	Transcription
A whole DNA molecule used ✓	A part (gene) of the DNA unwinds exposing the gene ✓
An (identical) DNA molecule is formed ✓ /double strand of DNA	An mRNA molecule is formed ✓ / single strand of RNA
Important for cell division/mitosis/meiosis ✓	Important for protein synthesis ✓
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 ✓ * <ul style="list-style-type: none"> – 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 ✓ <p style="text-align: right;">1 compulsory* + any 4</p>	(5) (8)
2.4.	2.4.1	Anaphase ✓ I/1/II /2	(1)
	2.4.2	(a) 2 ✓ (b) Two ✓/2	(1) (1)
	2.4.3	Paternal ✓/father Maternal ✓/mother	(2)

2.4.4



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 ✓

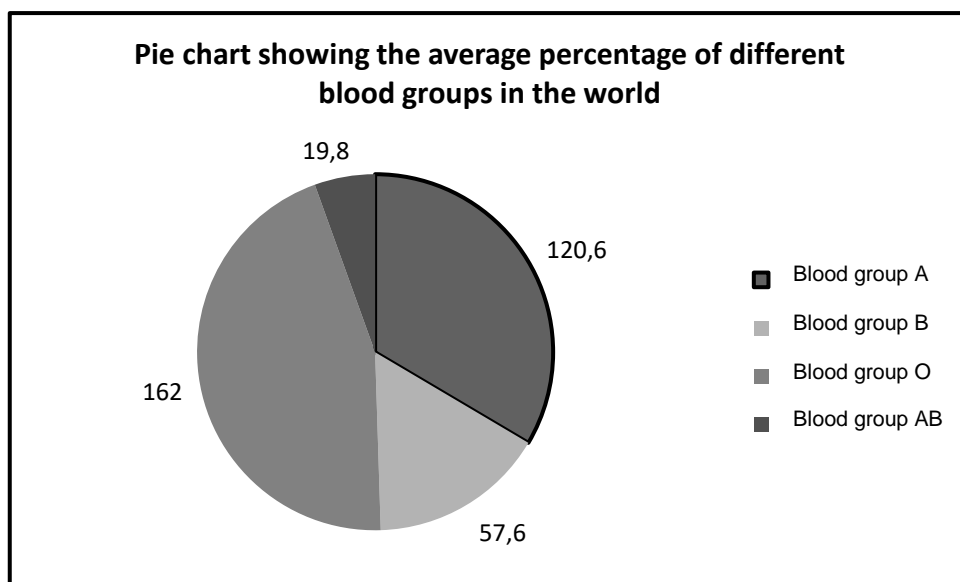
(1)

(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
$= \frac{33,5}{100} \times 360$	$= \frac{16,0}{100} \times 360$	$= \frac{45,0}{100} \times 360$	$= \frac{5,5}{100} \times 360$
$= 120,6^\circ$	$= 57,6^\circ$	$= 162^\circ$	$= 19,8^\circ$

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	1
	3 - 4 segments plotted accurately	2
Calculations: (C)	1 – 3 calculations correct	1
	All calculations correct	2
TOTAL		6

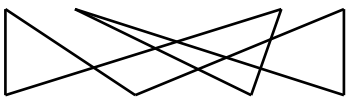
NOTE: If the wrong type of graph is drawn, marks will be lost for “correct type of graph” as well as for drawing the slices in correct proportions.

(6)
(9)

- 2.6 2.6.1 (a) nn ✓ (1)
(b) Nn ✓ (1)

2.6.2 Law of dominance ✓ (1)

2.6.3 **P₁** Phenotype Spotted fur x striped fur ✓
Genotype Nn x nn ✓
Meiosis
G/gametes N, n x n, n ✓
Fertilisation



F₁ Genotype Nn Nn nn nn ✓
1 Nn : 1 nn ✓

F₁ Phenotype 2 spotted fur : 2 striped fur * ✓ OR
1 spotted fur : 1 striped fur

* **Compulsory mark**

P₁ and F₁ ✓

Meiosis and fertilisation ✓

***Compulsory 1** + any 5

OR

P₁ 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 ✓		

F₁ Genotype Nn Nn nn nn ✓
1 Nn : 1 nn ✓

F₁ Phenotype 2 spotted fur : 2 striped fur * ✓ OR
1 spotted fur : 1 striped fur

* **Compulsory mark**

P₁ and F₁ ✓

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) $X^R X^r$ ✓ (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