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GRADE 12

SEPTEMBER 2021

**LIFE SCIENCES P2
MARKING GUIDELINE**

MARKS: 150

This marking guideline consists of 10 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 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 memo discussion 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. 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 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.

SECTION A**QUESTION 1**

- | | | | | |
|-----|--------|--|-------------|------|
| 1.1 | 1.1.1 | C ✓✓ | | |
| | 1.1.2 | D ✓✓ | | |
| | 1.1.3 | A ✓✓ | | |
| | 1.1.4 | B ✓✓ | | |
| | 1.1.5 | D ✓✓ | | |
| | 1.1.6 | A ✓✓ | | |
| | 1.1.7 | C ✓✓ | | |
| | 1.1.8 | B ✓✓ | | |
| | 1.1.9 | B ✓✓ | | |
| | 1.1.10 | B ✓✓ | (10 x 2) | (20) |
| 1.2 | 1.2.1 | Phenotype ✓ | | |
| | 1.2.2 | Autosomes ✓ | | |
| | 1.2.3 | Chiasmata ✓/chiasma | | |
| | 1.2.4 | Gene ✓ | | |
| | 1.2.5 | Transcription ✓ | | |
| | 1.2.6 | Cloning ✓ | | |
| | 1.2.7 | Homologous ✓chromosomes | | |
| | 1.2.8 | Locus ✓ | | (8) |
| 1.3 | 1.3.1 | B only ✓✓ | | |
| | 1.3.2 | Both A and B ✓✓ | | |
| | 1.3.3 | B only ✓✓ | | (6) |
| 1.4 | 1.4.1 | Meiosis ✓ | | (1) |
| | 1.4.2 | Metaphase 1 ✓ | | (1) |
| | 1.4.3 | (a) B ✓ | | (1) |
| | | (b) F ✓ | | (1) |
| | | (c) D ✓ and E ✓ | | |
| | | (Mark first TWO only) | | (2) |
| | 1.4.4 | 4 ✓/ four | | (1) |
| | 1.4.5 | Sperm ✓ / (not gamete) | | (1) |
| 1.5 | 1.5.1 | Million years ago ✓ | | (1) |
| | 1.5.2 | (a) C ✓/A | | (1) |
| | | (b) A ✓ | | (1) |
| | | (c) B ✓ | | (1) |
| | 1.5.3 | Various hypotheses relating to evolution have been tested and verified over time ✓ /has undergone several tests and is supported by evidence | | (1) |
| | 1.5.4 | - Biogeography ✓
- Genetics ✓
- Modification by descent ✓/homologous structures | (Any 3 x 1) | (3) |
| | | (Mark first THREE only) | | |

TOTAL SECTION A: 50

QUESTION 2

- 2.1 2.1.1 A – Centromere ✓ (1)
- 2.1.2 DNA Replication ✓ (1)
- 2.1.3 - The DNA molecule unwinds ✓
 - And unzips ✓/ the weak hydrogen bonds break
 - Each strand acts as a template ✓
 - Free floating nucleotides in the nucleoplasm ✓
 - Join to their complementary strand/base pair ✓/ (T-A; C-G)
 - Forming two identical strands of DNA ✓ (Any 4 x 1) (4)
- 2.1.4 - Produce two exact copies of the cells/ DNA ✓/chromosomes
 - So that each new cell formed in mitosis has the exact genetic material/ same amount of DNA as the parent cell ✓/chromosomes. (2)
- 2.2 2.2.1 Set 2 ✓ (1)
- 2.2.2 **All** the bands of the baby that don't match father 2 match mother 2 ✓✓
OR
All the DNA bars of the baby match that of father 2 and mother 2 ✓✓
OR
 The other parents' bands do not match **all** the bands of the baby ✓✓ (2)
- 2.2.3 blood ✓
 skin cell ✓
 hair cell ✓
 saliva ✓
Mark first TWO only (Any 2 x 1) (2)
- 2.2.4 Biological evidence in forensic investigations ✓/crime scenes/ identify criminals
 Tracing missing persons ✓
 Identify dead persons ✓/animals
 Identifying genetic disorders ✓
 Matching tissues for organ transplants ✓
 Establishing family relations ✓
Mark first TWO only (Any 2 x 1) (2)
- 2.3 2.3.1 The sickle shape red blood cells cause blockages in the blood vessels leading to damage of vital organs ✓/ transport less oxygen leading to less energy/ anaemia (1)
- 2.3.2 Stem cell are undifferentiated cells ✓ that have the potential to form any tissue ✓ or organ (2)

- 2.3.3 (a) CUU ✓ (1)
 (b) Glycine ✓ (1)
 (c) If Thymine changes to Adenine
 - The mRNA/codon will be GUG ✓ instead of GAG
 - The tRNA/anticodon will be CAC ✓ instead of CUC
 - Therefore, the amino acid will be Valine ✓
 - instead of Glutamine ✓ (4)

2.3.4

P₁	Phenotype	Normal male	x	Normal female ✓
	Genotype	HH ✓	x	Hh ✓
Meiosis				
	G/gametes	H, H	x	H, h ✓
Fertilisation				
F₁	Genotype	HH ; HH ; Hh ; Hh ✓		
	Phenotype	All Normal		

They have a **0% ✓*** chance of having a child with sickle cell disease

P₁ and F₁ ✓
 Meiosis and fertilisation ✓

Any 5 + *1 Compulsory

OR

P₁	Phenotype	Normal male	x	Normal female ✓												
	Genotype	HH ✓	x	Hh ✓												
Meiosis																
	G/gametes	H, H	x	H, h ✓												
Fertilisation F₁		<table border="1"> <tr> <td>Gametes</td> <td>H</td> <td>h</td> </tr> <tr> <td>H</td> <td>HH</td> <td>Hh</td> </tr> <tr> <td>H</td> <td>HH</td> <td>Hh</td> </tr> <tr> <td colspan="3">Correct genotypes ✓</td> </tr> </table>			Gametes	H	h	H	HH	Hh	H	HH	Hh	Correct genotypes ✓		
Gametes	H	h														
H	HH	Hh														
H	HH	Hh														
Correct genotypes ✓																
	Phenotype	All Normal														
They have a 0% ✓* chance of having a child with sickle cell disease																
P ₁ and F ₁ ✓ Meiosis and fertilisation ✓																

***1 Compulsory + Any 5**

(6)

- 2.4 2.4.1 Karyogram ✓ / Karyotype (1)
- 2.4.2 - Chromosome pair 23 ✓ has
- two X chromosomes ✓/XX/ chromosomes are the same size (2)
- 2.4.3 - Because there is a double set of chromosomes ✓/ 46 chromosomes/
it is diploid/ homologous pairs
- and not a single set of chromosomes ✓/ not 23 chromosomes/ not
haploid (2)
- 2.4.4 Down's Syndrome ✓/ trisomy 21 (1)
- 2.4.5 - Homologous chromosome pair 21 ✓
- does not separate ✓/non-disjunction
- This will lead to one gamete having two copies of chromosome 21 ✓
- When this gamete fuses with a normal gamete ✓
- the resulting zygote will have an extra copy of chromosome 21 ✓/ 3
copies of chromosome 21 (Any 3 x 1) (3)
- 2.5 2.5.1 Dihybrid ✓ Cross (1)
- 2.5.2 There are two different characteristics ✓ being crossed (1)
- 2.5.3 (a) bbtt ✓✓ (2)
- (b) Both Black and no white patches ✓✓
OR
Parent 1 - Black and no white patches ✓
Parent 2 – Black and no white patches ✓ (2)
- 2.5.4 - Since black coat is controlled by a dominant allele ✓
- the kitten could be homozygous/ BBtt or heterozygous ✓/Bbtt (2)
- 2.5.5 - The pair of alleles on homologous chromosomes separate ✓
- during meiosis ✓/anaphase/ gamete formation, so that
- only one allele of each pair is present in the gamete ✓/ offspring
can acquire one allele from each parent (3)

[50]

QUESTION 3

- 3.1 3.1.1 Graph showing the number of monarch butterfly colonies from 1994 to 2010 ✓ (1)
- 3.1.2 (a) Use of herbicide ✓ (1)
(b) Number of Monarch butterfly colonies ✓ (1)
- 3.1.3 - The number monarch butterfly colonies decreased from 1996 ✓
- before herbicides were used in 1998. ✓ (2)
- 3.1.4 - An organism whose DNA/genome has been modified ✓
- to express a desired characteristic ✓ (2)
- 3.1.5 - Less competition between crop and weeds ✓/ there will be more yield
- leading to an increase in the farmers' profit ✓ (1)
- 3.2 3.2.1 There was not enough food for them to eat ✓ (1)
- 3.2.2 - Lizards were separated by water ✓
- and therefore, there was no interbreeding ✓ (2)
- 3.2.3 - On the island there was variation in the size of *Gymnodactylus amarali* ✓/lizards
- Some lizards had smaller heads while others had larger heads ✓
- When there were more larger termites on the islands ✓
- Those with smaller heads died out ✓ since they could only eat small termites
- Those with larger heads survived ✓ could eat large termites
- they reproduced and passed on their characteristic of larger heads to their offspring ✓
- Eventually over time there was a greater proportion of lizards with larger heads ✓ (Any 5 x 1) (5)
- 3.2.4 - If the island species can interbreed with the mainland species ✓
- and produce fertile offspring they are the same species ✓/if they do not produce fertile offspring, they are not the same species (2)
- 3.1 3.3.1 *Homo sapiens* ✓ (1)
- 3.3.2 - to be able to tear ✓/ bite/ chew
- raw food ✓ (2)

3.3.3 Table ✓

Humans	Gorilla
1. Larger cranium ✓/brain	1. Smaller cranium ✓/brain
2. Flat face ✓/ Forehead slopes less backwards	2. Face sloping ✓/ Forehead slopes more backwards
3. Brow ridges are less pronounced ✓	3. Brow ridges are more pronounced ✓
4. Less protruding jaws ✓/ prognathous	4. More protruding jaws ✓/ prognathous
5. Lower jaw has a well-developed chin ✓	5. Lower jaw has a poorly developed chin ✓

(Mark first THREE only)

Table + (Any 3 x 2) (7)

- 3.3.4 - Opposable thumbs ✓
- Freely rotating arms ✓
- Elbow joints allowing rotation of forearm ✓
- Rotate hands at least 180° ✓
- (Flat) nails instead of claws ✓/bare fingertips
- Five digits/ pentadactyl

(Mark first TWO only)

(Any 2 x 1) (2)

- 3.4 3.4.1 - Australopithecus ✓
- Ardipithecus ✓

(2)

3.4.2 4 ✓ mya

(1)

3.4.3 (4.5 – 1) = 3.5 ✓✓ mya

(2)

- 3.4.4 - The foramen magnum has moved to the base of the skull ✓/ is in a more forward position so that the head can be held vertically. ✓/
spinal cord can be in line with the brain/ spine to enter the skull vertically
- The position of the pelvic girdle moved to under/the bottom of the core body ✓ so it is suitable to carry the weight of the upper body ✓
- The pelvis has become more cup shaped/wider and shorter ✓ which makes it suitable to carry the core/weight of the upper body ✓/ for better distribution of upper body weight
- The spine became S- shaped ✓ / greater lumbar curvature in spine for better balance ✓/to support the upper body weight

Mark first TWO only

(Any 2 x 2) (4)

- 3.4.5 (a) *Australopithecus africanus* ✓
- (b) Sterkfontein ✓ Caves
- (c) Robert Broom ✓/ John T Robinson

(1)

(1)

(1)

- 3.5 3.5.1 Modern humans originated in Africa ✓ and then migrated to other continents ✓ (2)
- 3.5.2 Fossil evidence ✓
mitochondrial DNA ✓/ mtDNA
Mark first TWO only (2)
- 3.5.3 Americas ✓ (1)
- 3.5.4 (200 000 – 45 000) ✓ years = 155 000 ✓ years (2)
- [49]**

TOTAL SECTION B: 100
GRAND TOTAL: 150