Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE

GRADE 12

JUNE 2022

LIFE SCIENCES MARKING GUIDELINE

MARKS: 150

This marking guideline consists of 9 pages.

SECTION A

QUESTION 1

1.1	1.1.1	D ✓✓		
	1.1.2	B ✓✓		
	1.1.3	A ✓✓		
	1.1.4	A ✓✓		
	1.1.5	C ✓✓		
	1.1.6	B ✓✓		
	1.1.7	A ✓✓		
	1.1.8	C ✓✓		
	1.1.9	A ✓✓		
	1.1.10	C ✓✓	(10 x 2)	(20)
1.2	1.2.1	Internal ✓ fertilisation		
	1.2.2	Umbilical vein ✓		
	1.2.3	Mitochondrion ✓/Mitochondria		
	1.2.4	Pinna ✓		
	1.2.5	Acrosome ✓		
	1.2.6	Puberty ✓		
	1.2.7	Chromatin ✓ network		
	1.2.8	Amniotic ✓egg	(8 x 1)	(8)
1.3	1.3.1	A only ✓✓		
	1.3.2	B only ✓✓		
	1.3.3	None ✓✓	(3 x 2)	(6)
1.4	1.4.1	DNA profiling ✓		(1)
	1.4.2	Adult C ✓		(1)
	1.4.3	• All bands of adult B and C together ✓ • match all the children's bands ✓		
		OR		
		• He is the only adult that can provide all the DNA bands ✓ with adult B that the children have ✓		(2)

1.4.4 • Child 1 and 2 ✓✓ (2)

1.4.5 • Tracing missing persons ✓
• Identify crime suspects ✓
• Identification of genetic disorders ✓
• Establishing family relations ✓
• Matching tissues for organ transplants ✓
• Identifying dead persons ✓/animals
(Mark first TWO only) (2)

1.5 1.5.1 (a) Dihybrid cross ✓ (1)

(b) Involves the inheritance of two characteristics ✓ (1)

1.5.2 1 ✓ (1)

1.5.3 FfBb ✓ (1)

1.5.4 (a) Fluffy tails and brown fur ✓ (1)

(b) ffBb ✓ (1)

1.5.5 $\frac{12}{16}$ ✓✓ **OR** $\frac{3}{4}$ **OR** 75% (2)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 2.1.1 (a) Deoxyribose ✓ (1)

(b) Nucleotide ✓ (1)

2.1.2
- The DNA (double helix) unwinds✓and
- unzips ✓/hydrogen bonds break
- to form two separate strands ✓
- Both DNA strands serve as templates ✓
- to build a complementary DNA ✓/(A to T and C to G) using free (DNA) nucleotides from the nucleoplasm
- This results in two identical (DNA) molecules ✓
- Each molecule consists of one original strand and one new strand ✓ (Any 6 x 1) (6)

2.1.3 Met ✓- Phe ✓- Cys ✓ (3)

2.1.4
- Codon AUG (on the mRNA) changed to AAG ✓
- Anticodon UAC (on tRNA) changed to UUC ✓
- which resulted in Lys ✓ being picked by tRNA and
- a different protein was formed ✓ (4)

2.2.1 (a) Locus ✓ (1)

(b) Centromere ✓ (1)

2.2.2 Heterozygous ✓ (1)

2.2.3 The alleles/letters representing the gene are different. ✓ (1)

2.2.4 Similarity:
- They carry the same genes at the same loci ✓/positions/locations

Difference:
- They carry different alleles ✓
- because of crossing over ✓ during meiosis and
- mutations ✓/copying errors during DNA replication

1 similarity + Any 2 differences (3)

2.3 2.3.1 (a) Zygote ✓ (1)

(b) Morula ✓/ Blastula (1)

2.3.2 Fertilisation ✓ (1)

2.3.3 In the fallopian tubes ✓/Oviducts (1)

2.3.4
- The process is oogenesis ✓
- Diploid cells in the ovary undergo mitosis ✓
- to form numerous follicles ✓
- At the onset of puberty ✓
- and under the influence of FSH ✓
- one cell inside a follicle enlarges and undergoes meiosis ✓
- Of the four cells that are produced, only one survives ✓
- to form a mature, haploid ovum ✓ (Any 6 x 1) (6)

2.3.5
- Amniotic fluid acts as a shock absorber and protect the foetus from mechanical injury ✓ /temperature changes/dehydration
- The placenta serves as a barrier protecting the foetus from certain diseases ✓ (2)

2.4

P_1	Phenotype	White patch	x	White patch ✓
	Genotype	Hh	x	Hh ✓
Meiosis				
	G/gametes	H, h	x	H, h ✓
Fertilisation				
F_1	Genotype	HH; Hh; Hh		hh ✓
	Phenotype	3 White patch: 1 Without white patch ✓*****		

P_1 and F_1 ✓
Meiosis and fertilisation ✓

*Compulsory 1 + Any 5

OR

P_1	Phenotype	White patch	x	White patch ✓
	Genotype	Hh	x	Hh ✓

Meiosis

Fertilisation

Gametes	H	h
H	HH	Hh
h	Hh	hh

1 mark for correct gametes
1 mark for correct genotypes

F_1	Phenotype	3 White patch: 1 Without white patch ✓*****

P_1 and F_1 ✓
Meiosis and fertilisation ✓

***1 Compulsory** + Any 5 (6)

2.5.1 Karyotype ✓ (1)

2.5.2 Autosomes ✓ (1)

2.5.3 Female ✓ (1)

2.5.4
- The last pair ✓/chromosome pair 23/gonosomes
- consist of two X chromosomes ✓/XX (2)

2.5.5
- During Anaphase ✓ I/II
- Chromosome pair 21/chromosome failed to separate ✓/ nondisjunction occurred at position 21
- Resulting in a gamete (daughter cell) with an extra chromosome ✓ at position 21
- When this gamete was fertilised by a normal gamete ✓
- The zygote ended up with 3 chromosomes at position 21 ✓ (5)

[50]

QUESTION 3

3.1 3.1.1 (a) Centriole ✓/ Centrosome (1)

(b) Spindle fibre ✓ (1)

3.1.2 Anaphase I ✓ (1)

3.1.3 Each chromosome of each homologous pair is being pulled to the opposite poles ✓ (1)

3.1.4 3 ✓ (1)

3.1.5 • The chromosomes show swapped segments of genetic material ✓ (1)

3.1.6 • Introduces genetic variation ✓ in offspring thereby
• improving the chances of survival ✓ (2)

3.2 3.2.1 (a) Menstruation ✓ (1)

(b) Ovulation ✓ (1)

3.2.2 (a) Follicle stimulating hormone ✓/FSH (1)

(b) Progesterone ✓ (1)

3.2.3 • Stimulates the development of primary follicles into mature Graafian follicle ✓ (1)

3.2.4 • The endometrial lining will no longer be maintained ✓
• This will result in the lining being broken down and shed ✓
• during menstruation ✓
• preventing possible implantation of the fertilised egg ✓
• and pregnancy ✓
• new follicle ✓ being formed (Any 5 x 1) (5)

3.3 3.3.1 (a) D ✓– Eustachian tube ✓ (2)

(b) E ✓– Round window ✓ (2)

3.3.2 Transmits sound vibrations to the middle ear. ✓ (1)

3.3.3 • They lie on three different planes ✓
• to detect movement in any direction ✓
• fluid moves in at least one of the semi-circular canals ✓
• to stimulate receptors ✓ (Any 3 x 1) (3)

3.4
- The receptor receives the stimulus ✓ and
- converts it into an impulse ✓
- which is transmitted by the sensory neuron ✓
- through the dorsal root ✓
- of the spinal nerve ✓
- to the spinal cord ✓
- where the impulse is transferred via the interneuron ✓
- to the motor neuron ✓
- which carries the impulse via the ventral root ✓
- to the effector ✓/muscle/gland
- The impulse is transferred from one neuron to the next via a synapse ✓

(Any 7 x 1) (7)

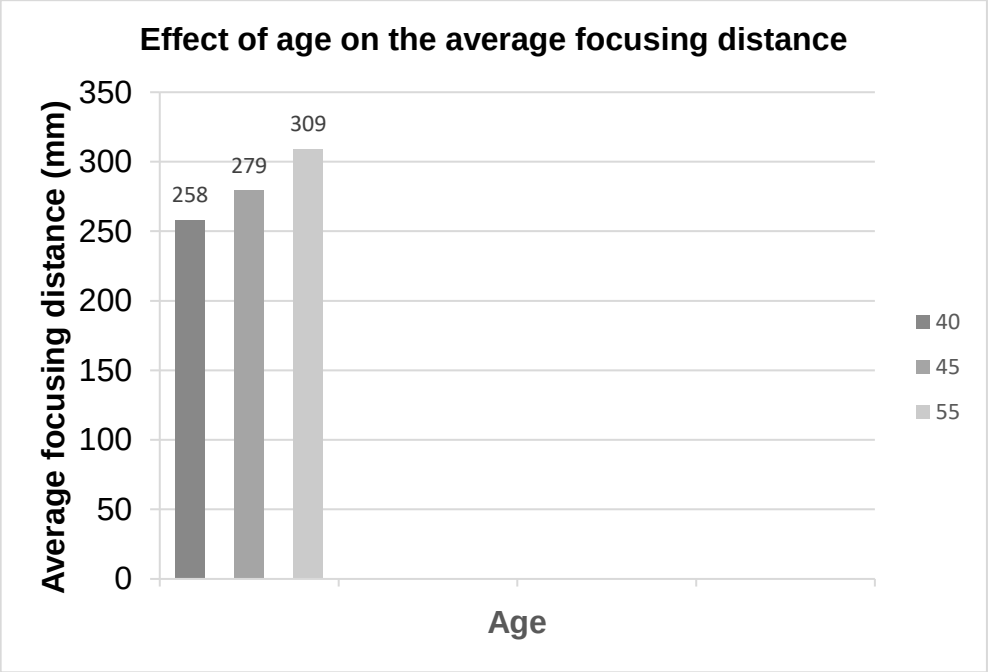
3.5 3.5.1 **X** $= \frac{292 + 301 + 297}{3}$ ✓

= 297 ✓mm ✓ (Accept 296,67/ 296,7) (3)

3.5.2 (a) Accommodation ✓ (1)

(b)
- Ciliary muscles contract ✓
- Suspensory ligaments slacken ✓/loosen
- Tension on the lens decreases ✓
- Lens becomes more convex ✓/more rounded/bulging
- Light rays are focused on the retina ✓ (5 x 1) (5)

3.5.3



(6)

Guideline for assessing the graph

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

3.5.4 As the age of the volunteers increase, the longer is the average focusing distance. ✓✓

OR

As the age of the volunteers decreases, the shorter is the average focusing distance ✓✓ (2)

[50]

TOTAL SECTION B: 100
GRAND TOTAL: 150