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**SA EXAM
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**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 **P₁** Phenotype White patch x White patch ✓
 Genotype Hh x Hh ✓

Meiosis

G/gametes H, h x H, h ✓

Fertilisation

F₁ Genotype $\left. \begin{matrix} \text{HH;} & \text{Hh;} & \text{Hh} \\ \hline \end{matrix} \right\}$ hh ✓

Phenotype 3 White patch: 1 Without white patch ✓*

P₁ and F₁ ✓
 Meiosis and fertilisation ✓

*Compulsory 1 + Any 5

OR

P₁ Phenotype White patch x White patch ✓
 Genotype Hh x Hh ✓

Meiosis

Gametes	H	h
H	HH	Hh
h	Hh	hh

Fertilisation

1 mark for correct gametes
 1 mark for correct genotypes

F₁ Phenotype 3 White patch: 1 Without white patch ✓*

P₁ and F₁ ✓
 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)

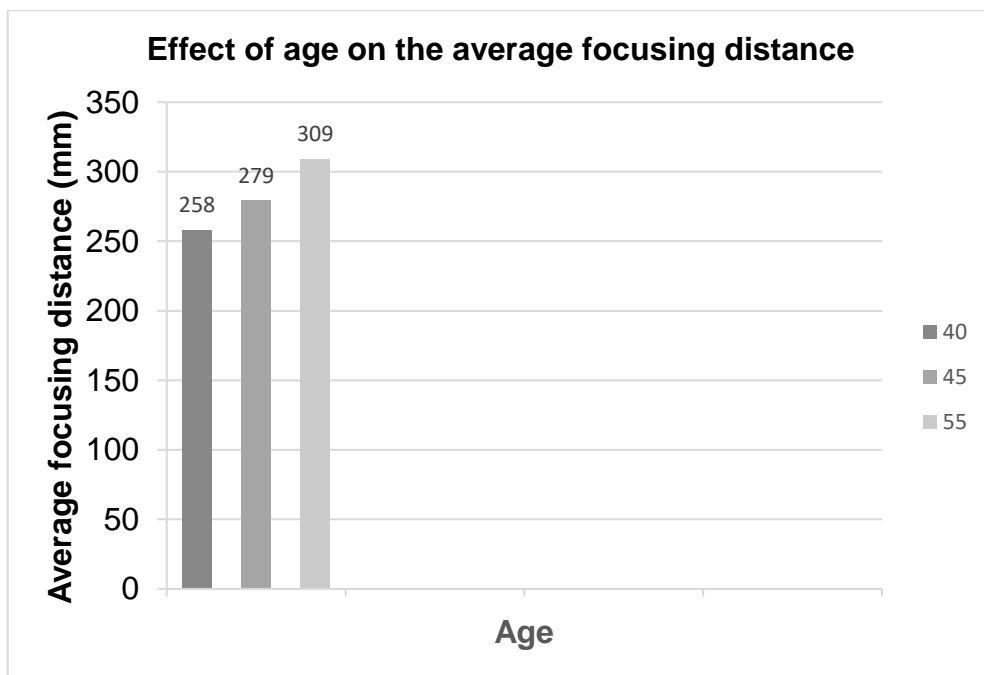
- 3.4
- The receptor receives the stimulus ✓ and
 - converts it into an impulse ✓
 - which is transmitted by the sensory neuron ✓
 - through the dorsal root ✓
 - of the spinal nerve ✓
 - to the spinal cord ✓
 - where the impulse is transferred via the interneuron ✓
 - to the motor neuron ✓
 - which carries 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



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