Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE

GRADE 12

JUNE 2017

LIFE SCIENCES MEMORANDUM

MARKS: **150**

This memorandum consists of 10 pages.

SECTION A

QUESTION 1

1.1 1.1.1 A ✓✓

1.1.2 A ✓✓

1.1.3 B ✓✓

1.1.4 C ✓✓

1.1.5 C ✓✓

1.1.6 D ✓✓

1.1.7 B ✓✓

1.1.8 A ✓✓

1.1.9 B ✓✓

1.1.10 D ✓✓ (10 x 2) (20)

1.2 1.2.1 Axon ✓

1.2.2 Multiple sclerosis ✓

1.2.3 Parasympathetic ✓

1.2.4 Co-dominance ✓

1.2.5 Continuous variation ✓

1.2.6 Metaphase 2 ✓

1.2.7 Umbilical vein ✓

1.2.8 Non-disjunction ✓

1.2.9 Ribosome ✓

1.2.10 Anticodon ✓ (10 x 1) (10)

1.3 1.3.1 B only ✓✓

1.3.2 A only ✓✓

1.3.3 A only ✓✓ (3 x 2) (6)

1.4 1.4.1 (a) Nucleus ✓ and Mitochondria ✓ (2)

(b) (DNA) replication ✓ (1)

(c) Interphase ✓ (1)

(d) Nucleotides ✓ (1)

(e) 1 – Thymine ✓ 2 – Guanine ✓ 3 – (Weak) hydrogen bond ✓ (3)

1.5 1.5.1 (a) 8/16 = ½ = 50% ✓

(b) 4/16 = ¼ = 25% ✓ (1)

1.5.2 (a) Ry ✓ (1)

(b) Ry, ry ✓ (1)

1.5.3 (e) Round and green ✓ (1)

1.5.4 8 Round yellow : 8 Round green = 1 : 1 ✓ (1)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 2.1.1 A – Nuclear membrane ✓ (1)
C – Nucleoplasm ✓ (1)
D – Cytoplasm ✓ (1)

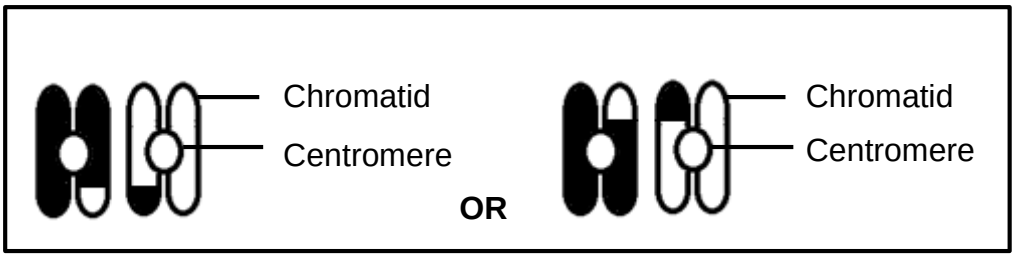
2.1.2 (a) Prophase 1 ✓ (1)

(b) Metaphase 1 ✓ (1)

2.1.3 Homologous chromosomes ✓/ Bivalent (1)

2.1.4 Crossing over ✓ (1)

2.1.5



Marking guideline	
Any 1 label	1 mark
Both chromosomes the same size	1 mark
Correct shading	1 mark

(3)

2.2 2.2.1 (a) 21 ✓ (1)
(b) 6 ✓ (1)
(c) 7 ✓ (1)

2.2.2 8 – GUG ✓ (1)
9 – CUG ✓ (1)
10 – ACU ✓ (1)
11 – CCU ✓ (1)

2.2.3 1 – Valine ✓ (1)
2 – Histidine ✓ (1)
3 – Leucine ✓ (1)

2.2.4 (a) Gene mutation ✓ (1)

(b) Glutamate ✓ (1)

2.2.5 - Since the sequence of nitrogenous bases in a gene ✓
- determines the sequence of amino acids ✓ in a protein molecule
- a mutation can change the amino acid sequence of the resulting protein. ✓
- Formation of a different protein ✓ leads to
- abnormal metabolism or cessation of metabolic activity ✓***I*** not functional. (Any 3 x 1) (3)

(15)

2.3 2.3.1 An increase / decrease in light intensity will cause, the diameter of the pupil to decrease / increase. ✓✓

OR

The diameter of the pupil will increase / decrease as the light intensity increases / decreases.

OR

An increase in light intensity will have no effect on the diameter of the pupil. ✓✓ (2)

2.3.2 (a) The diameter of pupil ✓ (1)

(b)
- The distance between the source of light and the position of the eye. ✓
- Same eye used at various light intensities. ✓
- Surrounding light must be kept at 0 lux ✓***I***dark. (Any 1 x 1) (1)

2.3.3 The diameter of pupil measured at 0 lux was used as a control ✓ to compare ✓ any change in diameter at various light intensities. (2)

2.3.4 7 – 2 = 5

$\frac{5}{7} \times 100$ ✓ $= 71{,}4\%$ ✓ (2)

2.3.5 Under high light intensity:
- The circular muscles of the iris contract ✓
- The radial muscle relax ✓
- The pupil constricts ✓
- The amount of light entering the eye is reduced. ✓ (4)

2.3.6 When the retina is exposed to high intensity light, the photoreceptor cells ✓ (rods and cones) will be damaged or destroyed ✓ causing blindness. ✓ (3)

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QUESTION 3

3.1 3.1.1 (a) Normal female ✓ (1)

(b) X^DX^d ✓ (1)

3.1.2
- Colour blindness is caused by a recessive allele ✓
- Carried on the X chromosomes ✓
- Females have two X chromosomes ✓ / Male only have one X chromosome
- Females must inherit two copies of the recessive allele ✓/ females who inherit only one of the recessive allele are still normal.

(Any 3 x 1) (3)

3.1.3

P_3 Phenotype Normal male × Colour blind female ✓

Genotype X^DY × X^dX^d ✓

Meiosis

Gametes X^D Y × X^d X^d

Fertilisation

F_3 Genotype $X^D X^d$ $X^D X^d$ $X^d Y$ $X^d Y$ ✓

Phenotype 2 normal daughters : 2 Colour blind sons

***50% chance of having a colour blind son**

P_3 and F_3 (P_1 and F_1) ✓

Meiosis and fertilisation ✓

(***1 Compulsory** + Any 6) (7)

OR

P_3 Phenotype Normal male × Colour blind female ✓

Genotype $X^D Y$ × $X^d X^d$ ✓

Meiosis

Fertilisation

Gametes	X^d	X^d
X^D	X^DX^d	X^DX^d
Y	$X^d Y$	$X^d Y$

1 mark for correct gametes
1 mark for correct genotypes

F_3 Phenotype 2 normal daughters : 2 Colour blind sons ✓

***50%** ✓ **chance of having a colour blind son**

P_3 and F_3 (P_1 and F_1) ✓

Meiosis and fertilisation ✓

(***1 compulsory** + Any 6) (7)

3.2 3.2.1 The shedding of the endometrium lining ✓ of the uterus accompanied by bleeding, ✓ occurs once in about 28 days. (2)

3.2.2 On the 14th ✓ day of the menstrual cycle. (1)

3.2.3 (a) The endometrium lining becomes thinner ✓***/*** decreases as it breaks down and detach from the uterus. (1)

(b) The endometrium wall gradually becomes thicker, ✓ more vascular and glandular. (1)

3.2.4 - The pituitary gland begins to secrete hormone oestrogen ✓ from the day 7 causing endometrium wall to become thicker, more vascular glandular. ✓
- The Luteinizing hormone ✓ secreted by the pituitary gland, causes ovulation ✓ / and converts the empty Graafian follicle into a structure called corpus luteum.
- The corpus luteum secretes a hormone known progesterone ✓ which causes further thickening of endometrium ✓ lining to prepare it for possible implantation of an embryo. (6)

3.2.5 - The higher levels of progesterone ✓ inhibit the secretion of FSH ✓ by the pituitary gland
- so that no further development of Graafian follicles ✓ to release mature ovum (ovulation) ✓ that may lead to possible fertilisation. (4)

3.3 3.3.1 An organism's complete set of genes. (1)

3.3.2 The cloning involves the transfer of a nucleus from the cell of an animal with a desirable trait ✓ into the ovum of another animal where the nucleus have been removed.✓ (2)

3.3.3 - To assess the risks to human health ✓ / environment
- To determine if the presence of the transferred gene will affect the expression of other genes ✓
- To test the effectiveness of the product ✓ (Any 1 x 1) (1)

3.3.4 - Produce crops that are resistant to adverse conditions ✓/ drought/ disease / pests.
- Increase crop yield. ✓
- Change the time for the ripening of fruits. ✓
- Increase shelf life of plant products. ✓
- Improve nutritional value of food. ✓
- Improve the taste of food. ✓
- Developing fruit/ plants with desirable characteristics. ✓ (Any 3 x 1) (3)

3.4
- The mitochondria contain (mitochondrial) DNA ✓
- At fertilisation, only the nucleus of the sperm cell enters the egg ✓
- to fuse with the nucleus of the egg cell. ✓
- Therefore, the zygote still contains the mitochondria and hence the mitochondrial DNA of the egg cell from the mother ✓
- This DNA is passed from mother to child. ✓
- Mutations in mitochondrial DNA enable us to trace our female line of descent. ✓ (6)

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SECTION C

QUESTION 4

***Accommodation of the eye** ✓
- The ciliary muscle relax ✓
- Suspensory ligaments become taut ✓
- Tension on the lens increases ✓
- The lens becomes flattened (less convex) ✓
- The refractive power of the lens is decreased ✓
- A clear image of the distant object which is the traffic robot is now focused on the retina ✓ (***1 compulsory mark** + Any 4) (5)

Hearing
- Pinna traps / directs the sound waves ✓
- Into the ear canal ✓/ meatus
- This causes the tympanic membrane to vibrate
- The vibration is transmitted to the auditory ossicles ✓/ name all 3
- The ossicles amplify the vibration ✓
- And transmit it to the oval window ✓
- The oval window vibrates ✓
- Creating waves ✓
- In the fluid / endolymph of the cochlea ✓
- Which stimulates the Organ of corti ✓
- To convert the wave into an impulse ✓
- The impulse travels along the auditory nerve ✓
- to the cerebrum ✓
- where it is interpreted as the siren of an ambulance. (Max. 7) (7)

Restoring balance

- The maculae ✓
- In the utriculus and sacculus ✓ and
- The cristae ✓
- In the semi-circular canals ✓ are stimulated
- They generate impulses ✓
- Which is transmitted through the auditory nerve ✓
- To the cerebellum ✓ where they are interpreted
- Impulses are transmitted via the motor neuron ✓
- to skeletal muscles ✓ (Max. 5)

Content: (17)
Synthesis: (3)
(20)

ASSESSING THE PRESENTATION OF THE ESSAY

Relevance	Logical sequence	Comprehensive
All information provided is relevant to the question.	Ideas arranged in a logical sequence.	Answered all aspects required by the essay.
All information provided is relevant to accommodation of the eye, hearing and restoring body balance.	All information regarding accommodation of the eye, hearing and restoring body balance is arranged in a logical manner.	At least the following marks should be obtained: Accommodation of the eye (**3/5**) Hearing (**5/7**) Restoring balance(**3/5**)
1 Mark	**1 Mark**	**1 Mark**

TOTAL SECTION C: 20
GRAND TOTAL: 150