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MID-YEAR EXAMINATION: PAPER 1 (2023)

SUBJECT: Life Science

Grade 12

EXAMINER:	J. J. Hanneman	MARKS:	120
MODERATOR:	C. van de Venter (Durban Girls College)	TIME:	120 minutes

MARKING GUIDELINES

QUESTION 1

- 1.1 1. L
 2. J
 3. G
 4. C
 5. A
 6. F
 7. H
 8. E
 9. I
 10. D

(10)

1.2.1 False ✓ Sexual ✓

1.2.2 True ✓✓

1.2.3 False ✓ anthers ✓ OR self ✓

1.2.4 False ✓ grafting ✓

1.2.5 True ✓✓

(10)

1.3.1 Type III ✓

(1)

1.3.2 Elephant: few live born ✓ high parent care results in higher survival rate of offspring ✓

Fish: high number of offspring produced ✓ low survival rate of offspring ✓

(4)

1.4.1 Sex-link characteristic ✓ Carried on the X chromosome ✓ Only one copy required in males ✓

ANY TWO

(2)

1.4.2

Number of individual	Genotype
8	$X^H X^H$
4	$X^h Y$ ✓
6	$X^H X^h$ ✓

7	$X^H Y$ ✓
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1.4.3

P1 genotype: $X^H X^h$ $X^H Y$ ✓

P1 phenotype: Carrier female Normal male ✓

Gametes: X^H or X^h (female) X^H or Y (male)

	X^H	X^h
X^H	$X^H X^H$	$X^H X^h$
Y	$X^H Y$	$X^h Y$

✓✓

F1 genotypes: $X^H X^H$; $X^H X^h$; $X^H Y$; $X^h Y$ ✓

F1 phenotypes: 25% carrier female, 25% normal female, 25% normal male, 25% haemophiliac male ✓

(6)

1.5.1 Insertion ✓ and deletion ✓

(2)

1.5.2 A frameshift mutation causes changes in the open reading frame ✓. This can cause the wrong amino acid sequence ✓

(2)

[40 MARKS]

QUESTION 2

2.1.1 Can obtain essential omega 3 fatty acids from eating rapeseed crops rather than from fish – already conserving already depleted fish stocks ✓ vegetarians can obtain omega fatty acids from rapeseed oils without having to buy additional supplements ✓

(ANY ONE) (1)

2.1.2 New gene may have unpredictable side effects ✓

People with particular dietary requirements may be against unknowingly ingesting GM crops ✓

May lead to allergies

(ANY ONE) (1)

2.1.3 Canola seed containing the omega fatty acid ✓ gene from plankton ✓ (2)

2.1.4 a) Restriction enzyme ✓ (1)

b) Ligase enzyme ✓ (1)

c) Flow diagram outlining the technique for gene transfer using *Agrobacterium tumefaciens* ✓

Plasmid removed from soil organism and a RE cuts the plasmid ✓

Required fatty acid gene is isolated gene from plankton and spliced into plasmid ✓

Recombinant plasmid returned to bacterium ✓

Bacteria infects canola plant and forms a tumour ✓

Omega fatty acid becomes integrated into bacterial cell ✓

Arrows ✓

(6)

2.2.1 Change in the nucleotide sequence ✓ of a DNA molecule ✓ (2)

2.2.2 They are closely related species ✓ with very similar genomes ✓
Arabidopsis model organism – easy manipulation of genome (2)

2.2.3 More seeds ✓ allows for higher productivity per acre ✓ (2)

2.2.4 a) Genome ✓
b) Gene editing /genetic modification ✓
(2)

2.3.1 Words: Both parents ✓ would be heterozygous with quagga gene recessive ✓
As a result one of the four possible offspring would be a double ✓
recessive ✓ resulting in a quagga ✓

OR

Diagram: Show both ✓ parents as Zz ✓
In grid show one ✓ zz ✓ indicate the offspring is quagga ✓ (5)

2.3.2 Mark first three arguments:

Yes: unique animal ✓ attracts tourists ✓
Provide biodiversity ✓ to prey species ✓
Study of genetics ✓ advances scientific knowledge ✓

OR

No: Limited time available ✓ better use for resources on other research ✓
There are other prey ✓ so could balance out ecosystem ✓
Competition with Plains zebra ✓ cause their extinction ✓ (6)

2.4.1 a) 1, pituitary gland ✓✓
b) 3, adrenal gland ✓✓
c) 4, pancreas ✓✓

2.4.2 a) Thyroxine ✓
b) Iodine ✓
c) Hypothyroidism ✓

QUESTION 3

- 3.1.1 E ✓
3.1.2 C ✓
3.1.3 F ✓
3.1.4 A ✓
3.1.5 D ✓
3.1.6 B ✓ (6)

- 3.1.7 a) Crossing over ✓ (1)
b) Random separation of chromosomes ✓ (1)

3.2.1 The individual is a female ✓ (1)

3.2.2 Somatic ✓ The cells are diploid / two sets of chromosomes present ✓ (2)

3.2.3 Weakening of spindle threads ✓ in the oocytes of mothers ✓ as mother's age increases ✓ (3)

3.2.4 Clearly stated opinion ✓ + Two valid, separate reasons ✓✓

Examples:

Yes, it is justifiable ✓ The cost of raising of a baby with potential defects ✓
Danger to the mother and baby if mother cannot carry to full term ✓ Emotional toll of future ✓

OR

No, it is not justifiable ✓ Too easy access to medical abortions ✓ No way to be sure of the severity of the effects of the syndrome ✓ (3)

3.2.5 A genetic counsellor is able to predict an outcome of the baby's genotype ✓ and provide guidance for future planning ✓ Specialties in medical/genetics and therapy/psychology/counselling (4)

(TWO marks for responsibilities + TWO marks for specialties)

- 3.3.1 Pituitary gland ✓ (1)
- 3.3.2 a) 100% ✓ (diploid) (1)
b) 50% ✓ (haploid) (1)
- 3.3.3 LH stimulates cells of Leydig ✓ to produce more testosterone ✓. Drops in testosterone prompt LH to stimulate testosterone once again ✓ (3)
- 3.3.4 Clearly stated opinion ✓ + TWO valid, separate reasons ✓✓ (3)
- 3.4.1 Process of oogenesis ✓ (1)
- 3.4.2 A: Mitosis ✓
B: Meiosis I ✓
C: Meiosis II ✓ (3)
- 3.4.3 Q: $2n$ (46) ✓
R: n (23) ✓
S: n (23) ✓ (3)
- 3.4.4 Q: Oogonia ✓
S: Polar body ✓
X: Ovum ✓ (3)

