



Province of the
EASTERN CAPE
EDUCATION

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

SEPTEMBER 2010

**LIFE SCIENCES – PAPER 1
MEMORANDUM**

MARKS: 150

TIME: 2½ hours

This memorandum consists of 11 pages.

SECTION A**QUESTION 1**

1.1

1.1.1 B ✓✓

1.1.2 C ✓✓

1.1.3 C ✓✓

1.1.4 C ✓✓

1.1.5 A ✓✓

5x2=(10)

1.2

1.2.1 Semen ✓

1.2.2 tRNA/transfer RNA ✓

1.2.3 Homozygous ✓

1.2.4 Autosome ✓

1.2.5 Nucleotide ✓

1.2.6 Cervix ✓

6x1=(6)

1.3

1.3.1 C ✓✓

1.3.2 A ✓✓

1.3.3 B ✓✓

1.3.4 A ✓✓

1.3.5 C ✓✓

5x2=(10)

1.4

1.4.1 A- XX ✓

B- XY ✓

C- X ✓

D- Y/X ✓

E- X/Y ✓

(5)

1.4.2 V- Oogenesis ✓

W- Spermatogenesis ✓

(2)

1.5

1.5.1 E✓ A ✓ D✓ B✓ F✓ C✓ or A✓ E ✓ D✓ B✓ F✓ C✓ (6)

1.5.2 A ligase enzyme✓ is used to bond the two sticky ends together (1)

1.5.3 A bacterium that has had its genetic make-up/gene sequence/DNA changed. ✓ (1)

1.5.4

- Extraction from the pancreas is a **time consuming** process✓✓
 - It is a very **costly** procedure. ✓✓
 - People may be opposed to using animal products for **religious/cultural/ethical** reasons. ✓✓
 - Some individuals may have an **allergic** reaction to the animal product . ✓✓
- Mark first one 1x2=(2)

1.6

1.6.1 B- Anaphase 1 ✓ C- Prophase 1 ✓
[Do not credit if only anaphase/prophase is given] (2)

1.6.2 1- Chiasma/Chiasmata ✓
2- Centromere ✓
3- Chromosome ✓ (3)

1.6.3 Testes ✓ and Ovaries✓ (2)
[50]

QUESTION 2

2.1

2.1.1 Adenine and Thymine are the same (30.3%) ✓ and Guanine and Cytosine are almost the same (19.5 and 19.9%). ✓ (2)

2.1.2

$$A + T = 31.7 + 31.7 = 63.4\%$$

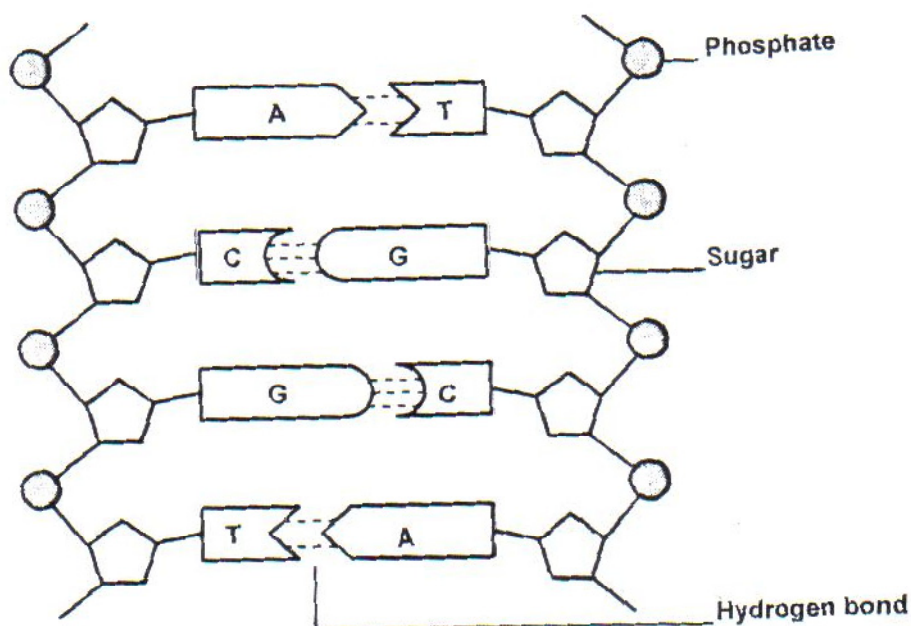
$$100 - 63.4 = 36.6\% \checkmark$$

$$\text{Guanine} = 36.6 \div 2 \checkmark$$

$$= 18.3\% \checkmark$$

(3)

2.1.3

Complete DNA strings**Mark allocation:**

- **Heading** = ✓
- **Correct complement base pairs**
 - ✓ 2 complementary base pairs correct
 - ✓ ✓ 4 complementary base pairs correct
- **Correctness of diagram:**
 - ✓ Hydrogen bond
 - ✓ correct sugar phosphate sequence
 - ✓ 2 DNA strands/chains/double helix

Any (5) (5)

2.2

Mitosis	Meiosis
1. 2 daughter cells formed	1. 4 daughter cells formed
2. Daughter cells have the same chromosome number as the parent cell.	2. The daughter cells have only half of the chromosome number of the parent cell.

Mark allocation: ✓ for drawing a table
 ✓ for each complete difference (Mark first 2) (3)

2.3

2.3.1 Ribosome ✓ (1)

2.3.2 Transcription: the process by which genetic information on a strand of DNA ✓ is used to synthesise a strand of complementary RNA/mRNA ✓

or

the formation of RNA ✓ from a DNA template ✓

Translation: the process by which the mRNA molecule ✓ specifies the linear sequence of amino acids ✓ on a ribosome ✓ for protein synthesis

or

the processing of information carried by mRNA ✓ into an amino acid sequence ✓

or

the formation of a polypeptide chain/protein ✓ on a ribosome during protein synthesis, according to the sequence carried by the mRNA ✓ (4)

2.3.3 mRNA – it carries the genetic code/codon ✓ to the ribosome for protein synthesis
 rRNA – it combines with a protein to form a subunit of a ribosome. ✓
 tRNA – are used to transfer amino acids to the ribosome ✓ during protein synthesis. (3)

2.4

Phenotype of parents	Tongue roller	Non-tongue roller
Genotype of parents (P_1)	Tt	tt
Meiosis		
Gametes	T t	t t
Fertilisation		
Genotype F_1 generation	Tt Tt tt tt	

Phenotype F_1 **50% tongue rollers and 50% non-tongue rollers**

1 mark for stating P_1 and F_1
 1 mark for stating meiosis and fertilization
 1 mark for correct gametes
 1 mark for correct genotypes of parents
 1 mark for correct genotypes of F_1 generation
 1 mark for correct phenotypes of F_1 generation

Any 5**(5)**

2.5

2.5.1

- Can be used to identify criminals and crime victims. ✓
- Can be used to resolve questions of paternity ✓

Mark first two

(2)

2.5.2

- Because only short DNA segments, rather than complete DNA strands, are compared it is possible that two individuals may yield identical results on a short DNA section. ✓✓
- There is always a chance of human error ✓ during the analysis ✓ of DNA results.
- It has been claimed that DNA can escape from skin cells. ✓ So it is possible that skin cell DNA can be picked up on the hands of any person at a crime scene. ✓ This may indicate that DNA found at a crime scene does not necessarily belong to the suspect.

Mark first ONE x 2

(2)**[30]**

QUESTION 3

3.1

3.1.1 (a) Prostate gland ✓ (1)

(b) It secretes alkaline fluid ✓ to neutralize the acid of the urethra ✓/vagina/improves movement of sperm. Secrete, enzyme that makes sperm more active. (2)

3.1.2 Circumcision ✓ (1)

3.1.3 Testosterone ✓ (1)

3.1.4 Sperm production is highly sensitive to body temperature. ✓ Hot baths decrease sperm production. ✓ Tight underwear pulls the scrotum against the body that has a temperature of about 37 °C. ✓ **Any two** (2)

3.1.5 The nucleus of a sperm contains the haploid number of chromosomes (23) ✓ while the nucleus of a body cell contains the diploid number of chromosomes (46) ✓ **Any one** (1)

3.1.6 (a) Fallopian tube/Oviduct ✓
(b) Ovary ✓ (2)

3.2

3.2.1 A – FSH ✓
B – Estrogen ✓/Oestrogen
C – Progesterone ✓ (3)

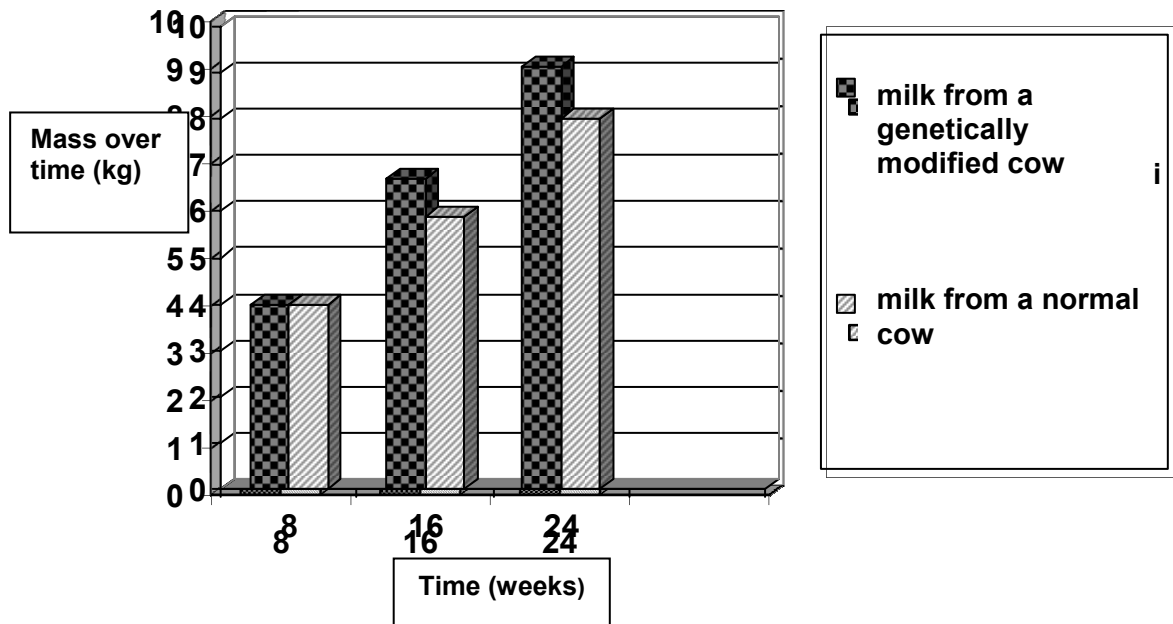
3.2.2 Ovulation: The release of an ovum ✓ from the mature follicle/Graafian follicle ✓ of the ovary. ✓ **Any two** (2)

3.2.3 The corpus luteum will continue to produce progesterone ✓ which prevents the production of FSH ✓ which stimulates the formation of new follicles. (2)

3.3

3.3.1

Bar graphs to show the mass gain of two different babies over a period of 24 weeks, fed with normal cow milk and milk from a genetically modified cow.



- √ - heading
- √ - key
- √ - labeling of x-axis
- √ - labeling of y-axis
- √ - scaling of y and x-axes
- √ - unit on x and y axes
- Plotting of columns: 1-3 correct √
- 4-6 correct √√

Any 6 (6)

3.3.2

- (a) Babies who are fed on milk from genetically modified cows put on more mass over time √ than babies who are fed with milk from normal cows. √ (2)
- (b) Babies put on too much mass; this might result in obesity and other related problems. √√ (2)

- 3.4
- 3.4.1 Lettuce seeds germinate poorly when planted deep, compared to peas/ Pea seeds germinate poorly when planted deep, compared to lettuce/ Lettuce and pea seeds germinate poorly/well when planted deeply. (2)
- 3.4.2 Soil type /
Amount of watering/
Light intensity /
Temperature
- Any other acceptable factor (other than depth) that would affect the growth. Any one (1)

[30]**SECTION C****QUESTION 4**

- 4.1
- 4.1.1 Normal shaped red blood cells present a larger surface area✓ for the absorption and transport of oxygen and carbon dioxide. Easy movement, no clumps. (1)
- 4.1.2 When a malaria parasite enters a sickle shaped red blood, it breaks down resulting in the death of the parasite✓✓ / A malaria parasite cannot survive in a sickle cell as these cells act as structural barriers in the life cycle of the parasite✓✓. Any 1x2=(2)
- 4.2
- 4.2.1 Genotype: 25% AA: 50% Aa: 25% aa✓✓
Phenotype: 25% normal: 50% normal / sickle-cell anaemia carrier / 75% normal: 25% sickle-cell anaemia sufferer✓✓ (4)
- 4.2.2 (a) There is a change in amino acid 6✓. In father's protein the amino acid is glu (glutamate/glutamic acid) and in mother's protein the amino acid is val (valine) ✓. Any 1 (1)
- (b) A mutation✓ has occurred. Nitrogenous bases shifted and the DNA code is changed✓. This resulted in a change in the amino acid sequence✓. Any 2 (2)
- 4.3
- 4.3.1 The stem cells were injected into the blood vessel/veins✓. (1)
- 4.3.2 $25 + 25 / 26 + 20 + 4 / 20 + 30 = 50$ patients ✓ (1)
- 4.3.3 Age✓/sex✓/disease✓ Any 1 (1)
- 4.3.4 Improvements (Type 1) $6/20 \times 100 \sqrt{=} 30 \% \sqrt{}$
Improvements (Type 2) $20/30 \times 100 \sqrt{=} 66,6 \% \sqrt{}$ (4)

- 4.3.5 Higher % of Type 2/non insulin dependent patients improved after stem cell treatment than Type 1/insulin dependent patients.√√
Lower % of type 1/non insulin patients improved after stem cell treatment than Type 2/non-insulin dependent patients.√√ 1x2=(2)
- 4.3.6 - when one uses human embryos for research, one is actually using human lives√.
-The use of embryos and the destruction√ of the embryo after stem cell research are unethical.
(Accept any related answer) Any 1 (1) (Mark first ONE only) (1)
- 4.4
- 4.4.1 Table showing the nutritional requirements of a woman before and during her pregnancy. √ **(Both variables to qualify for 1 mark) (1)**
- 4.4.2 Calcium: $1,2 - 0,4 = 0,8$
 $\frac{0,8 \times 100}{0,4} = 200\%$ √ (2)
- 4.4.3 (a) Should be rejected. √ (1)
(b) Vitamin D is needed three times more than usual during pregnancy. √ (1)
- 4.5
- Eat a balanced diet√:
Nutrients must be consumed in their right proportions√. Intake of calcium, iron, protein and vitamins must be increased. √
 - Avoid smoking and drugs√:
These substances can be transported to the blood of the foetus where it can cause severe foetal damage√. Smoking and drugs increases the risks that the placenta will not function optimally√. This results in the unavailability of oxygen to the foetus causing delayed growth or premature labour.√
 - Alcohol can lead to Foetal-Alcohol-Syndrome (FAS).√
This results in delayed growth√, deviations of the face √ (small head, small eyes that are far apart and absence of a vertical groove between the upper lip and nose), delayed physical development and mental retardation.√
 - Work and leave√:
Pregnant woman can work until five weeks before the due dates, provided there are no complications√. She should not engage in hard labour that may compromise her baby√. She is allowed four months maternity leave. This gives her enough time to care for her new-born.√
 - Exercise√:
Exercise increases her blood circulation.√ She should follow a less strenuous programme towards the end of her pregnancy.√

- Medical care√:
 She should ensure regular checks with her doctor√. Ultra-sound scans are performed at 12, 20, 32 weeks to detect abnormalities and proper development of the foetus√. An amniocentesis can be done at 14 weeks. This procedure can detect any chromosomal abnormalities.√
(Accept any other logical and relevant answer)Any 6 6x2=(12)

ASSESSING THE PRESENTATION OF THE ESSAY

MARKS	DESCRIPTIONS
3	Well structured – demonstrates insight and understanding of question
2	Minor gaps in the answer
1	Attempted but with significant gaps in the answer
0	Not attempted / nothing written other than the question number

Synthesis - (3)
[15]

TOTAL SECTION C: 40

GRAND TOTAL: 150