MEMORANDUM

SUBJECT:	**LIFE SCIENCES P1 (10831)**

LIFE SCIENCES
(First Paper)

MEMORANDUM

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]

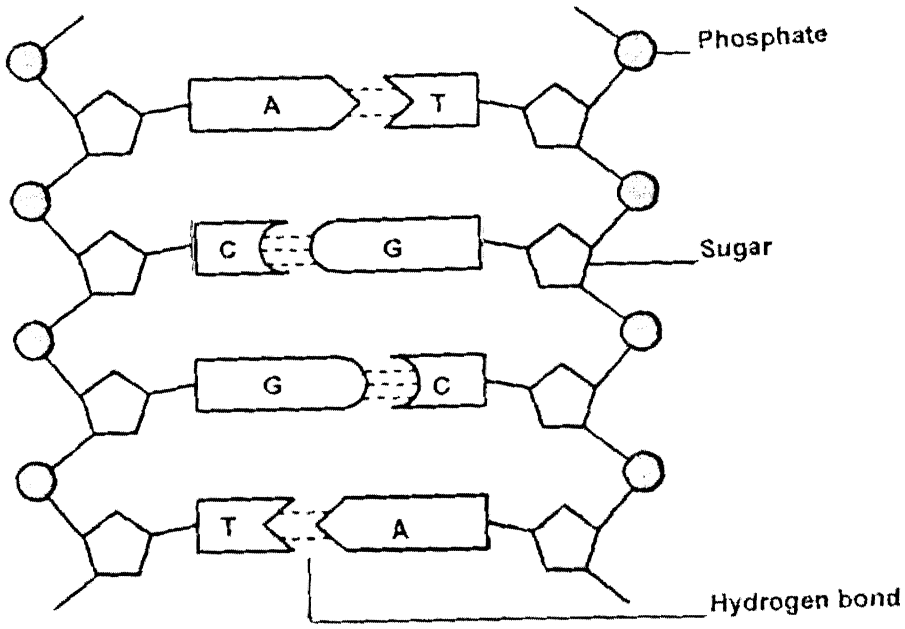
QUESTION 2

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% √
Guanine = 36.6 ÷ 2 √
= 18.3% √ (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 x Non-tongue roller

Genotype of parents (P_1): **Tt x 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 (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

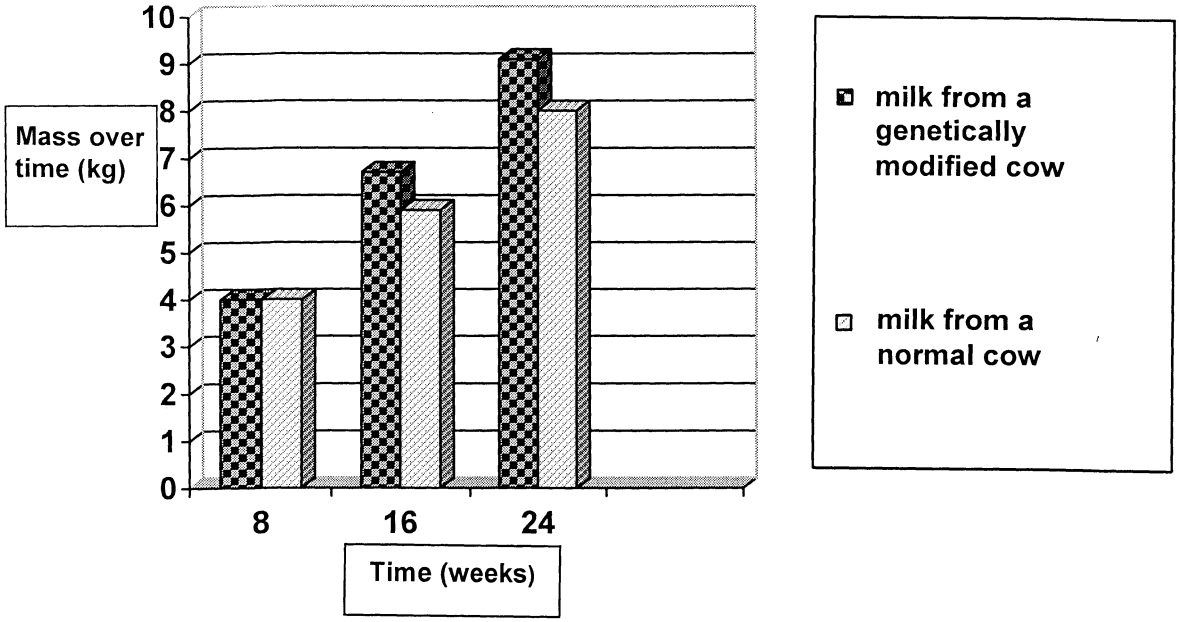
3.2.1 A – FSH √
B – Estrogen √
C – Progesterone √ (3)

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 graph. 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. (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 x 100 √= 30 %√
Improvements (Type 2) 20/30 x 100 √= 66,6 %√ (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. 5 = 0.7
0.7 / 0. 5√ x 100 = 140%√ (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

(3)
[15]

TOTAL SECTION C: 40

GRAND TOTAL: 150

- Mediese sorg√:
  Gereelde doktersondersoeke moet gedoen word.√. Ultrasoniese skanderings word gedoen op 12, 20, 32 weke vir die vasstelling van abnormaliteite en die monitering van behoorlike ontwikkeling van die fetus. √. 'n Amnionsintese kan op 14 weke gedoen word. Hierdie prosedure kan enige chromosomale abnormaliteite opspoor.√
  (Aanvaar enige ander logiese en relevante antwoord) Enige 6 6x2=(12)

ASSESSERING VAN DIE OPSTEL

PUNTE	BESKRYWING
3	Goed gestruktureer – toon insig en begrip van die vraag
2	Klein gapings in die antwoord
1	Poging is aangewend maar groot gapings in die antwoord
0	Geen poging / niks behalwe die vraagnommer is geskryf nie

(3)
[15]

TOTAAL AFDELING C: 40

GROOTTOTAAL: 150

4.3.5 Groter % Tipe 2/nie-insulienafhanklike pasiënte het verbeter na die stamselbehandeling as Tipe 1/insulienafhanklike pasiënte.√√
Kleiner % Tipe 1/ nie-insulienafhanklike pasiënte het verbeter na stamselbehandeling as Tipe 2/nie-insulienafhanklike pasiënte.√√ Enige 1x2=(2)

4.3.6 - wanneer menslike embrio's gebruik word vir navorsing, word menslike lewens gebruik√.
- Die gebruik en vernietiging van embrio's√ nadat dit vir stamselnavorsing gebruik is, is oneties.
(Aanvaar enige verwante antwoord) (Merk slegs eerste EEN) (1)

4.4

4.4.1 Tabel wat die vereistes voedingstowwe van 'n vrou toon voor en tydens swangerskap. √
(Beide veranderlikes moet teenwoordig wees vir 1 punt) (1)

4.4.2 Kalsium: 1.2 – 0. 5 = 0.7
0.7 / 0. 5√ x 100 = 140%√ (2)

4.4.3 (a) Moet verwerp word. √ (1)
(b) Vitamien D word drie maal meer benodig tydens swangerskap as voor swangerskap. √ (1)

4.5

- Eet 'n gebalanseerde dieet√:
  Die verhoudings waarin voedingstowwe ingeneem word, moet korrek wees.√ Die inname van kalsium, yster, proteïene en vitamiene moet verhoog. √
- Vermy rook en dwelmmiddels√:
  Hierdie stowwe kan na die bloed van die fetus vervoer word waar dit ernstige fetale skade kan aanrig√. Rook en dwelmmiddels verhoog die risiko dat die plasenta nie optimaal funksioneer nie.√. Dit kan daartoe lei dat die fetus nie genoegsame suurstof ontvang nie wat kan lei tot vertraagde groei en vroeggebore babas.√
- Alkohol kan lei tot Fetale Alkoholsindroom (FAS).√
  Dit lei tot vertraagde groei √, afwykings in die gesig √ (klein kop, klein oë ver uit mekaar en die afwesigheid van 'n vertikale groef tussen die bo-lip en die neus), vertraagde fisieke ontwikkeling en verstandelike vertraagdheid.√
- Werk en verlof √:
  Swanger vroue kan werk tot 5 weke voor die verwagte datum, indien daar geen komplikasies is nie √. Sy moet nie deelneem aan harde arbeid wat die baba kan benadeel nie.√. Bevallingsverlof van 4 maande word toegestaan. Dit voorsien genoegsame tyd vir die versorging van die pasgeborene. √
- Oefening√:
  Oefening verbeter die bloedsirkulasie. 'n Minder veeleisende program moet aan die einde van die swangerskap gevolg word.√

3.4

3.4.1 Slaaisade ontkiem baie swak as hulle te diep geplant is in vergelyking met ertjies/ Ertjiesade ontkiem baie swak as hulle te diep geplant is in vergelyking met slaai/Slaai en ertjiesade ontkiem swak/goed wanneer hulle diep geplant word. (2)

3.4.2 Grondtipe/
Hoeveelheid water/
Temperatuur/
Hoeveelheid lig

Enige ander aanvaarbare faktor (behalwe diepte) wat die groei kan affekteer. Enige een (1)
[30]

AFDELING C

VRAAG 4

4.1

4.1.1 Rooibloedselle met 'n normale vorm het 'n groter oppervlakte √ vir die absorpsie en vervoer van suurstof en koolstofdioksied. (1)

4.1.2 Wanneer 'n malaria-parasiet 'n sekelvormige rooibloedsel binnedring, word die sel vernietig en gaan die parasiet dood. √√ / 'n Malaria-parasiet kan nie oorleef in 'n sekelsel nie en hierdie selle vorm dus 'n strukturele versperring in die lewensiklus van die parasiet.√√. (Enige 1) 1x2=(2)

4.2

4.2.1 Genotipe: 25% AA: 50% Aa: 25% aa√√
Fenotipe: 25% normaal: 50% normaal / sekelselanemie-draer /
75% normaal: 25% sekelselanemie-lyer√√ (4)

4.2.2 (a) Daar is 'n verandering in aminosuur 6√. In die vader se proteïen is die aminosuur glu (glutamaat/glutamiese suur) en in die moeder se proteïen is die aminosuur val (valien) √. Enige 1 (1)

(b) 'n Mutasie√ het plaasgevind. Stikstofbasisse het geskuif en die DNA-kode is verander √. Dit het gelei tot die verandering van die aminosuur-volgorde √. Enige 2 (2)

4.3

4.3.1 Die stamselle is ingespuit in die bloedvate/are√. (1)

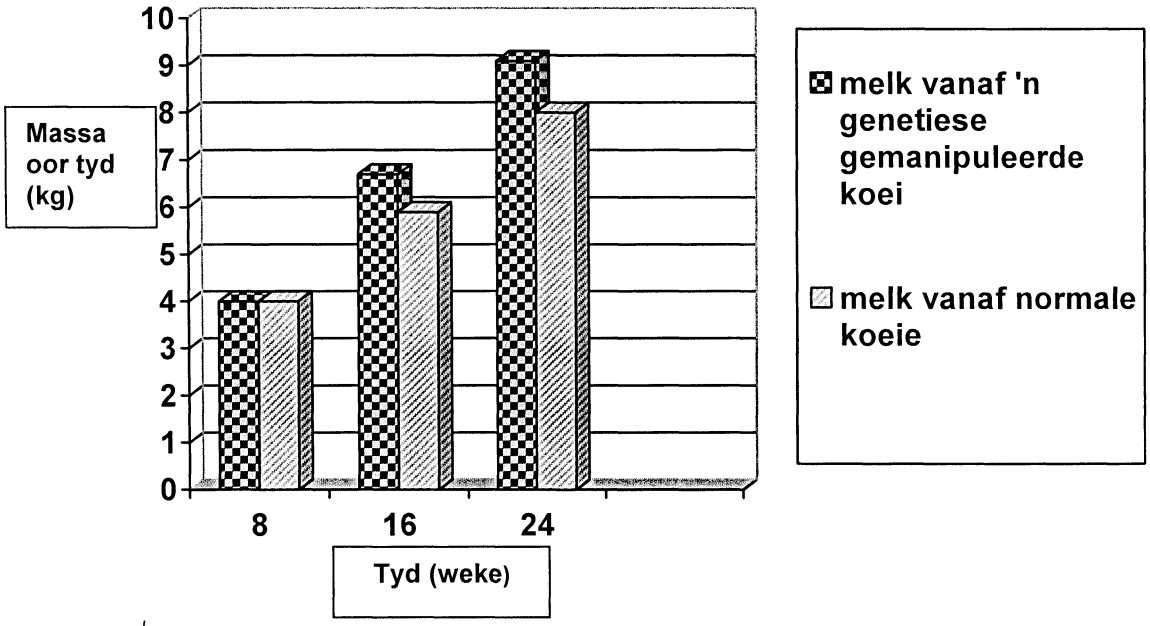
4.3.2 25 + 25 / 26 + 20 + 4 / 20 + 30 = 50 pasiënte √ (1)

4.3.3 Ouderdom√/geslag√/siekte√ Enige 1 (1)

4.3.4 Verbeteringe (Tipe 1) 6/20 x 100 √= 30 %√
Verbeteringe (Tipe 2) 20/30 x 100 √= 66,6 %√ (4)

3.3

3.3.1 **Kolomgrafiek wat die massa-toename van twee verskillende babas , wat gevoed is op gewone beesmelk en melk afkomstig van 'n geneties gemanipuleerde koei, oor 'n periode van 24 weke toon.**



√ - opskrif
√ - sleutel
√ - benoeming x-as
√ - benoeming y-as
√ - skaal van y en x-as
√ - eenhede op x en y as
Stip van kolomme: 1-3 korrek √
4-6 korrek √√

Enige 6 (6)

3.3.2 (a) Babas wat gevoed is op melk afkomstig van geneties gemanipuleerde koeie tel meer gewig op oor tyd √ as babas wat gevoed is op gewone koeimelk. √ (2)

(b) Babas tel te veel gewig op, en dit kan moontlik lei tot obesiteit en ander verwante probleme. √√ (2)

VRAAG 3

3.1

3.1.1 (a) Prostaatklier √ (1)

(b) Dit skei 'n alkaliese vloeistof af √ wat die sure van die uretra/vagina neutraliseer √ (2)

3.1.2 Besnyding √ (1)

3.1.3 Testosteroon √ (1)

3.1.4 Spermproduksie is baie sensitief vir liggaamstemperatuur. √ Warm baddens verlaag spermproduksie. √ Noupassende onderklere trek die skrotum teen die liggaam vas wat 'n temperatuur van ongeveer 37 °C het.√ **Enige twee** (2)

3.1.5 Die nukleus van 'n spermsel bevat die haploïde chromosoomgetal (23) √ terwyl die nukleus van 'n liggaamsel die diploïde chromosoomgetal (46) bevat √ **Enige een** (1)

3.1.6 (a) Fallopiusbuis/Oviduk √
(b) Ovarium √ (2)

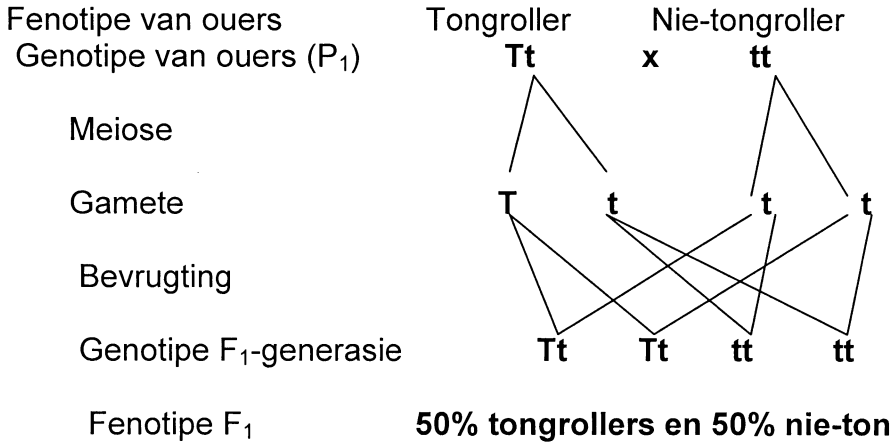
3.2

3.2.1 A – FSH √
B – Estrogeen √
C – Progesteroon √ (3)

3.2.2 Ovulasie: Die vrystelling van 'n ovum √ uit die volwasse follikel/Graafse follikel √ van die ovarium √ **Enige twee** (2)

3.2.3 Die corpus luteum sal aanhou met die produksie van progesteroon √ wat die produksie van FSH verhoed √ wat die vorming van nuwe follikels stimuleer. (2)

2.4



1 punt vir stel van P_1 en F_1 1 punt vir stel van meiose en bevrugting 1 punt vir korrekte gamete 1 punt vir korrekte genotipe van ouers 1 punt vir korrekte genotipe van F_1 generasie 1 punt vir korrekte fenotipes van F_1 generasie

Enige 5 (5)

2.5

2.5.1

- Kan gebruik word om kriminele en misdaadslagoffers te identifiseer.
- Kan gebruik word om ouerskapkwessies op te los.

Merk eerste twee (2)

2.5.2

- Omdat slegs kort DNA-stukke gebruik word vir vergelyking, en nie lang stringe nie, is dit moontlik dat twee individue identiese resultate vir kort stukke kan lewer. √√
- Daar is altyd die moontlikheid van menslike foute √ tydens die analise √ van DNA-resultate.
- Daar is al beweer dat DNA deur die selle van die vel kan beweeg. √ Dit is dus moontlik dat DNA van die velselle opgetel kan word deur die hande van enige persoon wat die misdaadtoneel besoek. √ Dit kan moontlik aandui dat die DNA wat op die misdaadtoneel gekry is, nie noodwendig behoort aan die verdagte nie. √ Merk eerste een **x 2** (2)

[30]

2.2

Mitose	Meiose
1. 2 Dogterselle vorm	1. 4 Dogterselle vorm
2. Dogterselle het dieselfde chromosoomgetal as die moedersel.	2. Die dogterselle het slegs die helfte van die chromosoomgetal van die moedersel.

Puntetoekenning: √ alle lyne van tabel is duidelik geteken
√ vir elke volledige verskil (Merk eerste twee) (3)

2.3

2.3.1 Ribosoom √ (1)

2.3.2 Transkripsie: die proses waartydens die genetiese inligting van een string van DNA √ gebruik word om een komplementêre RNA- string/mRNA te sintetiseer √

of

die vorming van RNA √ vanaf 'n DNA-templaat √

Translasie: die proses waar die mRNA-molekule √ die aminosuurvolgorde spesifiseer √ op 'n ribosoom √ vir proteïensintese.

of

die verwerking van inligting gedra deur die mRNA √ tot 'n aminosuurvolgorde √

of

die vorming van 'n polipeptiedketting/proteïen √ op 'n ribosoom tydens proteïensintese, deur gebruik te maak van die volgorde gedra op die mRNA √ (4)

2.3.3 mRNA – dit dra die genetiese kode/kodon √ na die ribosoom vir proteïensintese
rRNA – dit verbind met 'n proteïen en vorm 'n onderdeel van 'n ribosoom √ /
tRNA – word gebruik vir die oordra van aminosure na die ribosoom √
tydens proteïensintese (3)

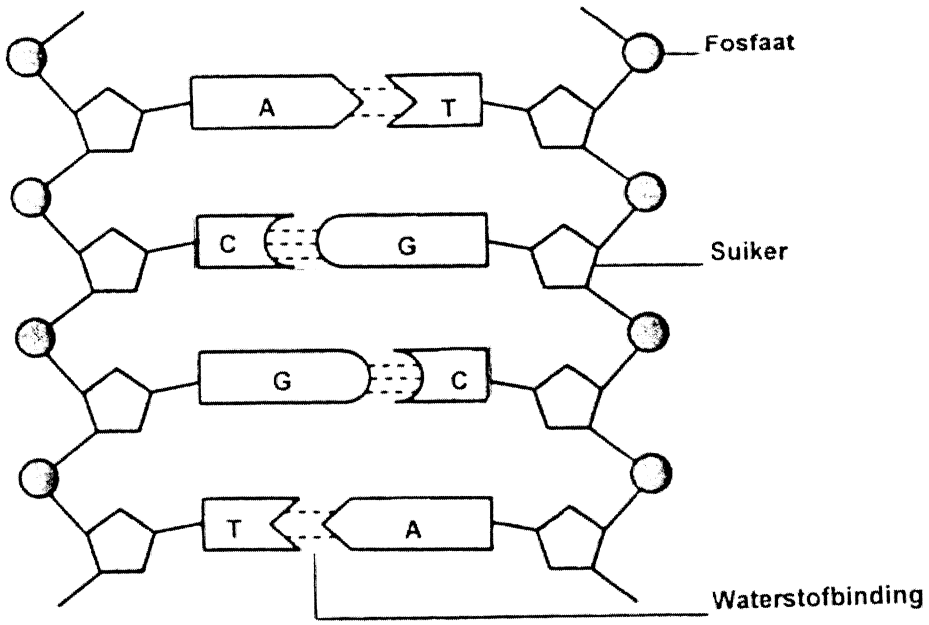
VRAAG 2

2.1

2.1.1 Adenien en Timien is dieselfde (30.3%) √ en Guanien en Sitosien is amper dieselfde (19.5 en 19.9%). √ (2)

2.1.2 A + T = 31.7 + 31.7 = 63.4%
100 – 63.4 = 36.6% √
Guanien = 36.6 ÷ 2 √
= 18.3% √ (3)

2.1.3 **Volledige DNA-stringe**



Puntetoekenning
- **Opskrif =** √
- **Korrekte komplementêre basispare**
  √ 2 korrekte komplementêre basispare
  √ √ 4 korrekte komplementêre basispare

Korrektheid van diagram:
√ waterstofbinding
√ suiker-fosfaat volgorde korrek
√ 2 DNA-stringe /dubbelheliks

Enige 5 (5)

1.5

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

1.5.2 'n Ligase-ensiem✓ word gebruik om die twee klewerige eindpunte te bind. (1)

1.5.3 'n Bakterie waarvan die genetiese samestelling/geenvolgorde/DNA verander is. ✓ (1)

1.5.4

- Ekstrahering vanuit die pankreas is 'n **tydrowende** proses. ✓✓
- Dit is 'n **baie duur** prosedure. ✓✓
- Mense kan teen die gebruik van dierlike produkte wees op grond van **geloofs-/kulturele/etiese oortuigings**. ✓✓
- Sommige individue kan 'n **allergiese** reaksie toon op dierlike produkte✓✓

Merk eerste 1 1x2=(2)

1.6

1.6.1 B- Anafase 1 ✓ C- Profase 1 ✓
[Geen punte word toegeken as slegs die naam gegee is nie] (2)

1.6.2 1- Chiasma/Chiasmata ✓
2- Sentromeer ✓
3- Chromosoom ✓ (3)

1.6.3 Testes ✓ en Ovariums✓ (2)

[50]

LEWENSWETENSKAPPE
(Eerste Vraestel)

MEMORANDUM

AFDELING A

VRAAG 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/oordrag RNA	✓	
1.2.3	Homosigoties	✓	
1.2.4	Outosoom	✓	
1.2.5	Nukleotied	✓	
1.2.6	Serviks	✓	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- Oögenese	✓	
	W- Spermatogenese	✓	(2)

MEMORANDUM

VAK:	**LEWENSWETENSKAPPE V1 (10831)**