



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**NASIONALE
SENIOR SERTIFIKAAT**

GRAAD 12

(LFSC.1)

LEWENSWETENSKAPPE V1

FEBRUARIE/MAART 2014

PUNTE: 150

TYD: 2½ uur

Hierdie vraestel bestaan uit 16 bladsye.

OGGENDSESSIE



INSTRUKSIES EN INLIGTING

Lees die volgende instruksies aandagtig deur voordat die vrae beantwoord word.

1. Beantwoord AL die vrae.
2. Skryf AL die antwoorde in die ANTWOORDEBOEK.
3. Begin die antwoorde op ELKE vraag boaan 'n NUWE bladsy.
4. Nommer die antwoorde korrek volgens die nommeringstelsel wat in hierdie vraestel gebruik word.
5. Bied jou antwoorde volgens die instruksies by elke vraag aan.
6. Maak ALLE tekeninge met 'n potlood en die byskrifte met blou of swart ink.
7. Teken diagramme en vloedigramme slegs wanneer dit gevra word.
8. Die diagramme in hierdie vraestel is NIE noodwendig volgens skaal geteken NIE.
9. MOENIE grafiekpapier gebruik NIE.
10. Jy moet 'n nieprogrammeerbare sakrekenaar, 'n gradeboog en 'n passer gebruik, waar nodig.
11. Skryf netjies en leesbaar.



AFDELING A**VRAAG 1**

1.1 Verskeie opsies word as moontlike antwoorde op die volgende vrae gegee. Kies die korrekte antwoord en skryf slegs die letter (A tot D) langs die vraagnommer (1.1.1 tot 1.1.10) in die ANTWOORDEBOEK neer, byvoorbeeld 1.1.11 D.

1.1.1 'n Geleidelike verandering in die struktuur van organismes met verloop van tyd staan as ... bekend.

- A evolusie
- B 'n mutasie
- C proteïensintese
- D natuurlike seleksie

1.1.2 Die volgende is stellings oor evolusie:

- (i) Kunsmatige seleksie en metamorfose toon hoe evolusie in organismes kon plaasgevind het.
- (ii) Daar is ooreenkomste tussen verskillende organismes.
- (iii) Gebruik of ongebruik van 'n orgaan veroorsaak dat dit gewysig word.
- (iv) Alle vorme van lewe ontwikkel uit eenvoudige vorme.

Watter kombinasie van stellings hou verband met Erasmus Darwin se idees oor evolusie?

- A (i), (ii), (iii) en (iv)
- B (ii), (iii) en (iv)
- C (i), (ii) en (iv)
- D (i), (iii) en (iv)

1.1.3 Watter EEN van die volgende is die gevolg van kunsmatige seleksie?

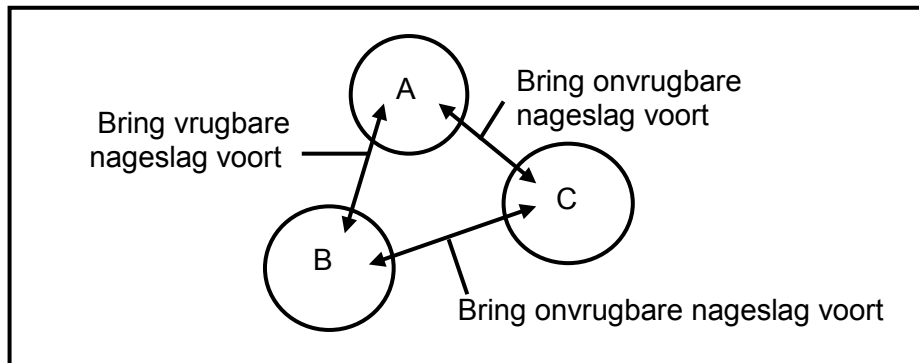
- A DDT-weerstandigheid in muskiete
- B Die effek van antibiotika op bakterieë neem af
- C Verhoogde melkproduksie in melkbeeste
- D Pepermotte word nie deur predatore waargeneem nie

1.1.4 Watter van die volgende verteenwoordig EEN voordeel en EEN nadeel van genetiese manipulasie in die ontwikkeling van die verlangde produkte?

	Voordeel	Nadeel
A	Verhoogde produksietempo	Ontwikkelingskoste is hoog
B	Ontwikkelingskoste is hoog	Moontlike vrystelling van die GGO ('GMO') in die omgewing
C	Groter reeks produkte	Verhoogde produksietempo
D	Verhoogde produksietempo	Groter reeks produkte



- 1.1.5 Die diagram hieronder toon die vrugbaarheid van die nageslag wat voortgebring word wanneer drie muisbevolkings, **A**, **B** en **C**, kruisteel.



Watter EEN van die volgende stellings oor bevolkings **A**, **B** en **C** is die KORREKTE interpretasie van die inligting in die diagram hierbo?

- A Al drie bevolkings is van dieselfde spesie.
 - B Bevolking A en C is van dieselfde spesie, maar bevolking A en B is van verskillende spesies.
 - C Bevolking B en C is van verskillende spesies, maar bevolking A en B is van dieselfde spesie.
 - D Bevolking A en B is van verskillende spesies, maar bevolking B en C is van dieselfde spesie.
- 1.1.6 By die mens is die alleel vir bloedgroep A dominant oor die alleel vir bloedgroep O. Al twee ouers se bloedgroep is A. Hulle kind se bloedgroep is O.

Wat is die beste verklaring vir hierdie patroon van oorerflikheid?

- A Die kind het die bloedgroep direk by 'n grootouer geërf.
 - B Die ouers is homosigoties vir die bloedgroepallele.
 - C Die ouers is heterosigoties vir die bloedgroepallele.
 - D Daar was 'n mutasie in die bloedgroepallele.
- 1.1.7 In 'n ondersoek is daar bevind dat 10% van die basisse in 'n DNS/DNA-molekule timien was. Wat was die verhouding van timien tot guanien in dieselfde molekule?

- A 1 : 2
- B 1 : 3
- C 1 : 1
- D 1 : 4

1.1.8 Nadat 'n sekere verskynsel waargeneem is, kan 'n wetenskaplike 'n ... formuleer.

- A teorie
- B hipotese
- C feit
- D wet

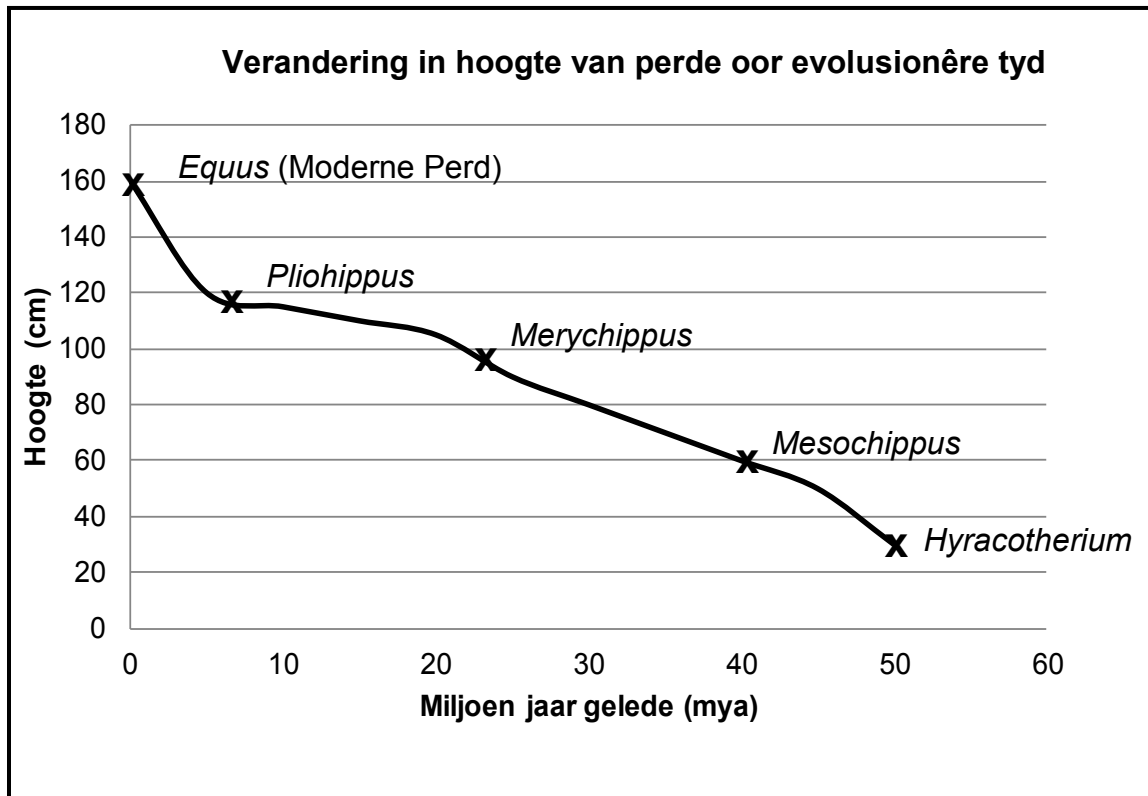
1.1.9 Gene in organismes kan deur die mens gemanipuleer word om nuttige stowwe te vervaardig. Een voorbeeld van 'n nuttige stof wat op hierdie wyse vervaardig word, is die menslike proteïen insulien, wat gebruik word om diabetes te behandel.

Watter EEN van die volgende is 'n akkurate beskrywing van hoe menslike insulien vervaardig en gebruik kan word om diabetes te behandel?

- A Neem insulien uit bakterieë en plaas dit in 'n mens, wat dan veroorsaak dat die mens insulien kan vervaardig.
- B Neem insuliengene uit bakterieë en plaas dit in 'n mens, wat die mens dan in staat stel om insulien te vervaardig.
- C Neem insuliengene uit 'n mens en plaas dit in bakterieë. Gebruik die insulien wat deur die bakterieë vervaardig word om diabetes te behandel.
- D Neem insulien uit 'n mens en laat dit in bakterieë groei. Gebruik die insulien wat deur die bakterieë vervaardig word om diabetes te behandel.



1.1.10 Die grafiek hieronder toon die veranderinge in die hoogte van perde oor evolusionêre tyd.



[Aangepas uit *Biologie*, Jones en Jones, 1993]

Wat kan met redelike sekerheid uit die grafiek hierbo afgelei word?

- A Die toename in hoogte is deur klimaatsveranderinge veroorsaak.
- B Die hoogte van die perd het met verloop van tyd verander.
- C *Mesochippus* was hoër as *Merychippus*.
- D Oor 100 jaar sal die perd beduidend hoër as die perde van vandag wees.

(10 x 2)

(20)

1.2 Gee die korrekte **biologiese term** vir elk van die volgende beskrywings. Skryf slegs die term langs die vraagnommer (1.2.1 tot 1.2.8) in die ANTWOORDEBOEK neer.

- 1.2.1 'n Oorgeërfde siekte wat hemoglobien aantas en die vorm van rooibloedselle verander
- 1.2.2 Die genetiese samestelling van 'n organisme ten opsigte van die allele wat dit bevat
- 1.2.3 Die algehele verdwyning van 'n spesie vanaf die Aarde
- 1.2.4 Die volledige stel gene wat in 'n organisme teenwoordig is
- 1.2.5 Die vermoë van 'n organisme om op twee bene te loop
- 1.2.6 Die chromosoomkomplement/chromosoomtoestand van 'n liggaamsel wat twee stelle chromosome besit
- 1.2.7 Die punt waar chromatiede van homoloë chromosome gedurende meiose kruis
- 1.2.8 'n Visuele voorstelling van 'n organisme se chromosome (8)

1.3 Dui aan of elk van die stellings in KOLOM I van toepassing is op **SLEGS A**, **SLEGS B**, **BEIDE A EN B** of **GEENEEN** van die items in KOLOM II nie. Skryf **slegs A**, **slegs B**, **beide A en B** of **geeneen** langs die vraagnommer (1.3.1 tot 1.3.8) in die ANTWOORDEBOEK neer.

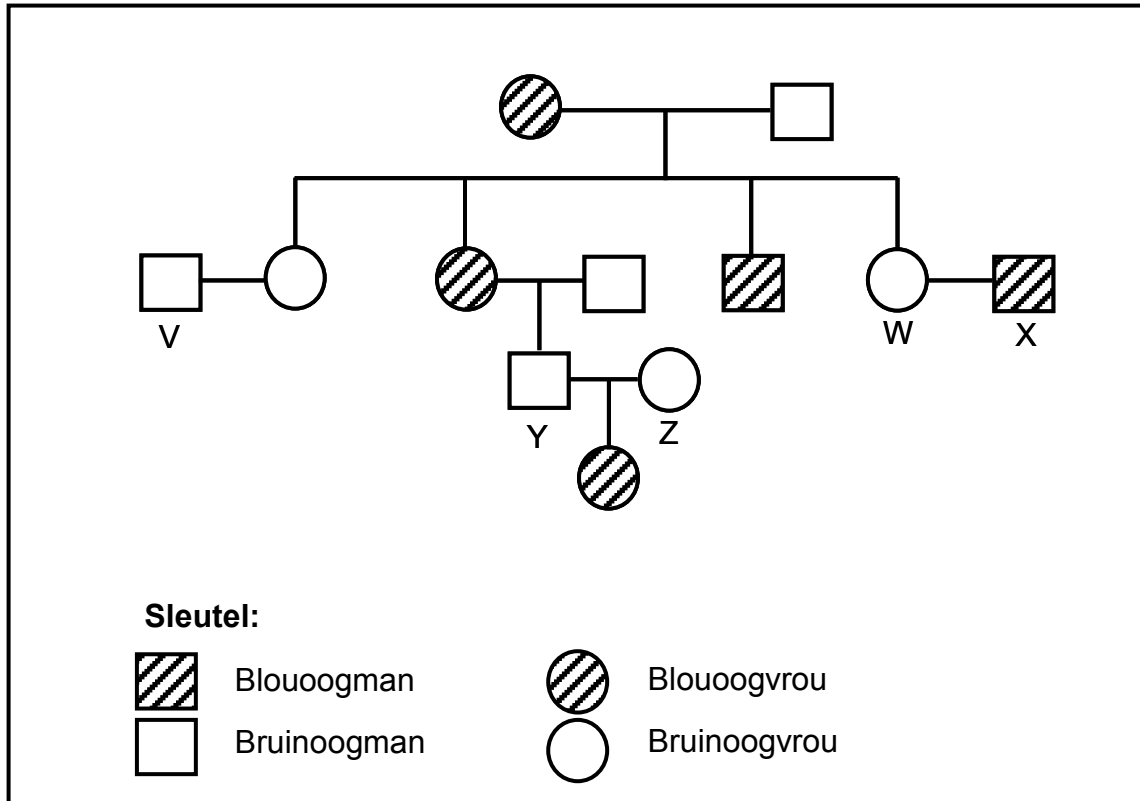
KOLOM I		KOLOM II	
1.3.1	Eienskappe word deur die nageslag by die ouers oorgeërf	A:	Lamarck se waarneming
		B:	Darwin se waarneming
1.3.2	Oorsake van variasie gedurende meiose	A:	Ewekansige bevrugting
		B:	Ewekansige paring
1.3.3	Gee bewyse van gemeenskaplike voorouers	A:	Homoloë strukture
		B:	Analoë strukture
1.3.4	Boek wat deur Darwin geskryf is	A:	<i>HMS Beagle</i>
		B:	<i>On the Origin of Species</i>
1.3.5	Voortplantings-isolasiemeganisme	A:	Hofmakery
		B:	Teel dieselfde tyd
1.3.6	Fossiele in Suid-Afrika gevind	A:	Mev. Ples
		B:	Lucy
1.3.7	Genetiese bewyse vir die 'Uit Afrika'-hipotese	A:	DNS/DNA van die X-chromosoom
		B:	DNS/DNA van ribosome
1.3.8	Verhoog variasie in 'n spesie	A:	Kloning
		B:	Mutasie

(8 x 2)

(16)



- 1.4 By die mens is die alleel vir bruin oogkleur (B) dominant oor die alleel vir blou oogkleur (b). 'n Wetenskaplike het inligting ingesamel oor die oorerwing van oogkleur in 'n sekere familie. Dié inligting word in die stamboomdiagram hieronder voorgestel.



VRAAG 1.4.1 en 1.4.2 verwys na die volgende moontlike antwoorde (i, ii, iii, iv). Skryf slegs die nommer (i, ii, iii of iv) langs die vraagnommer (1.4.1–1.4.2) neer.

- (i) Hulle het dieselfde fenotipe en dieselfde genotipe.
- (ii) Hulle verskil in fenotipe, maar het dieselfde genotipe.
- (iii) Hulle het dieselfde fenotipe, maar verskil in genotipe.
- (iv) Hulle verskil in beide fenotipe en genotipe.

1.4.1 As persoon **V** homosigoties vir die dominante oogkleuralleel is, watter van die stellings hierbo is WAAR vir persoon **V** en persoon **W**? (2)

1.4.2 Watter van die stellings hierbo is WAAR vir persoon **Y** en persoon **Z**? (2)

1.4.3 Wat is die persentasie kans dat persoon **W** en persoon **X** 'n blouoogkind sal hê? (2)
(6)

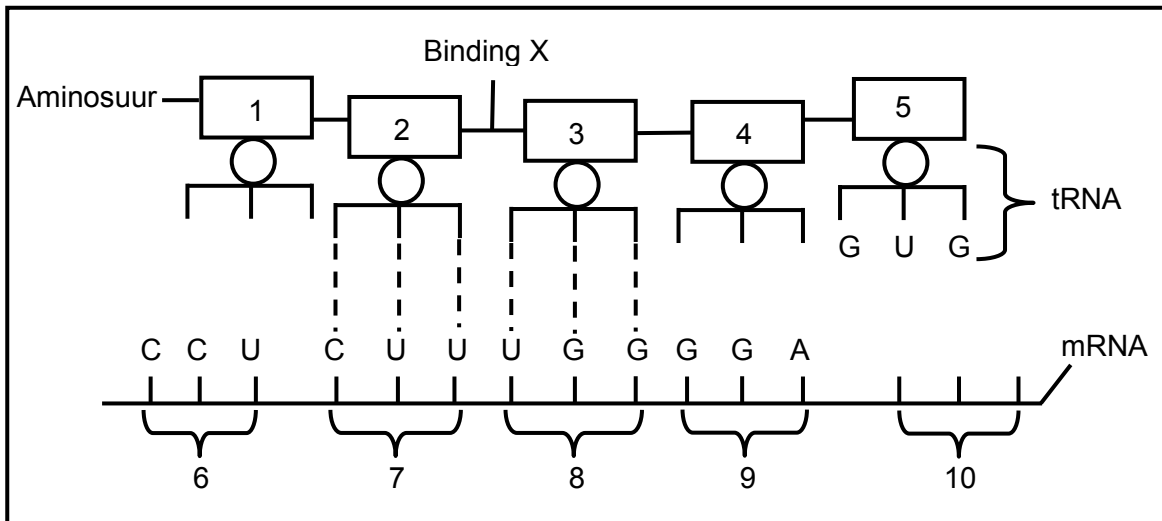
TOTAAL AFDELING A: 50



AFDELING B

VRAAG 2

2.1 Bestudeer die diagram hieronder, wat 'n stadium van proteïensintese toon.



- 2.1.1 Noem die stadium van proteïensintese wat deur die diagram hierbo voorgestel word. (1)
- 2.1.2 Skryf die DNS/DNA-drietalbassis neer wat met die kodons genummer **6** en **10** ooreenstem. (2)
- 2.1.3 Noem:
 - (a) Die binding wat deur **X** verteenwoordig word (1)
 - (b) Die organel waarin die proses wat in die diagram hierbo voorgestel word, plaasvind (1)
- 2.1.4 Die tabel hieronder toon die aminosure wat vir verskillende tRNA-antikodons kodeer.

Antikodons van tRNA	Gekodeerde aminosuur
CCU	Prolien
GAA	Glutamaat
GGA	Glisien
CUU	Leusien
GUG	Histidien
ACC	Treonien
CAC	Valien
UGG	Triptofaan

Gebruik die inligting in die diagram hierbo en:

- (a) Skryf die name van die aminosure neer wat vir die kodons genummer **7** en **9** gekodeer word (2)
 - (b) Identifiseer aminosuur **5** (1)
- (8)**



- 2.2 Sistiese fibrose is 'n genetiese afwyking wat deur die abnormale vervaardiging van mukus/slym in die longe van die mens gekenmerk word. Dit word veroorsaak deur 'n mutasie in 'n geen op chromosoom 7 wat vir die proteïen CFTR kodeer. Die proteïen CFTR bestaan uit 1 480 aminosure. Die normale volgorde en die mutasiedeel van die geen word hieronder getoon.

Volgorde	Basisdrietal van die stikstofbasiess						
Normaal	ATT	ATC	ATC	TTT	GGT	GTT	TCC
Mutasie	ATT	ATC	TTT	GGT	GTT	TCC	

- 2.2.1 Hoe weet ons dat die basisdrietal wat voorgestel word, DNS/DNA verteenwoordig? (1)
- 2.2.2 Noem die tipe geenmutasie wat deur die inligting in die tabel hierbo voorgestel word. (1)
- 2.2.3 Verduidelik die effek van die geenmutasie wat in VRAAG 2.2.2 genoem is. (2)
(4)

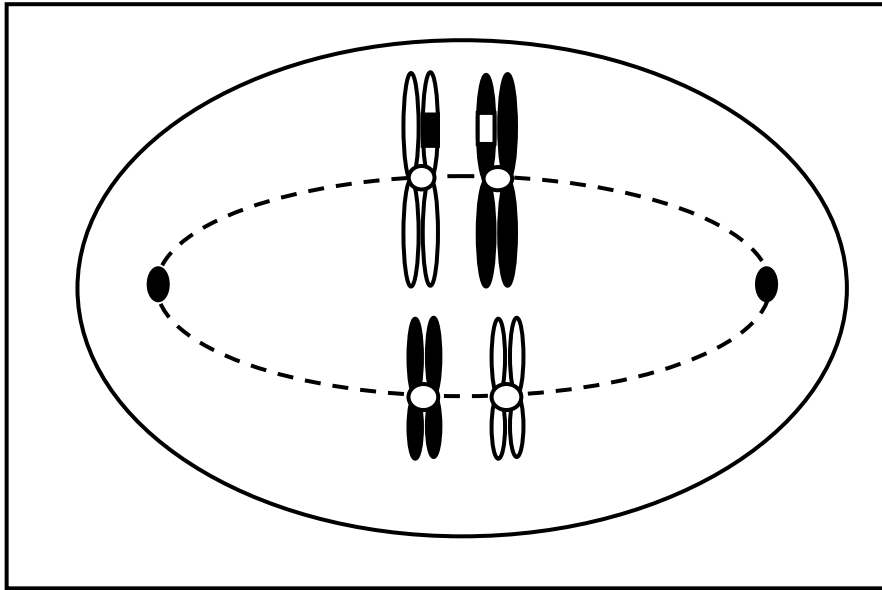
- 2.3 Die oorerwing van pelskleur in katte is aan geslag gekoppel. Die skilderkleur by katte is 'n kombinasie van swart en oranje pels. Die alleel vir swart pels word deur X^B verteenwoordig en die alleel vir oranje pels word deur X^O verteenwoordig.

'n Wyfiekat met 'n skilderkleur paar met 'n oranje mannetjieskat.

WENK: Die geslagschromosome/gonosome by katte is dieselfde as by die mens.

- 2.3.1 Gebruik die simbole X^B , X^O en Y om 'n genetiese kruising te toon van die paring soos hierbo genoem. Toon ook die verhouding van die F_1 -fenotipes aan. (7)
- 2.3.2 Verduidelik waarom die mannetjieskatjies nooit die skilderpelskleur kan hê nie. (2)
- 2.3.3 Verduidelik waarom die wyfiekatjies die skilderpelskleur kan hê. (2)
(11)

2.4 Die diagram verteenwoordig 'n sel in metafase van meiose I.

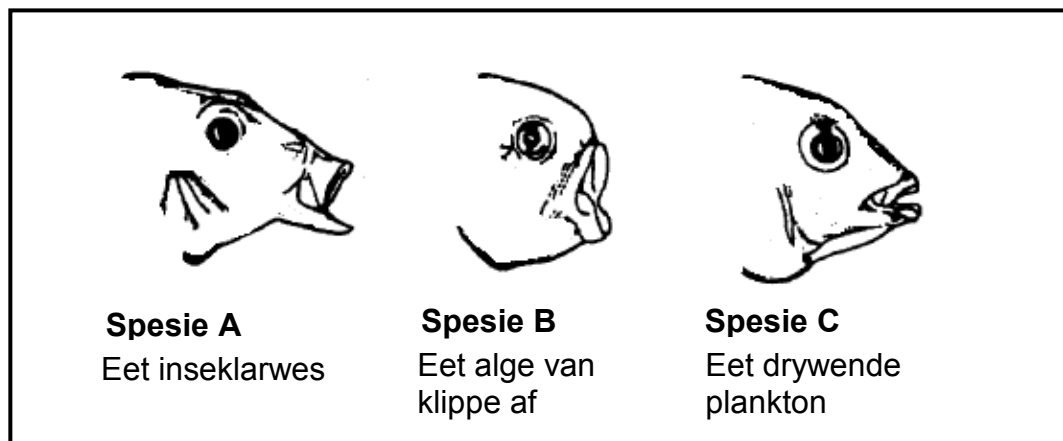


Teken 'n diagram met volledige byskrifte om EEN van die selle wat die gevolg hiervan is, in dieselfde fase van meiose II voor te stel.

(7)
[30]

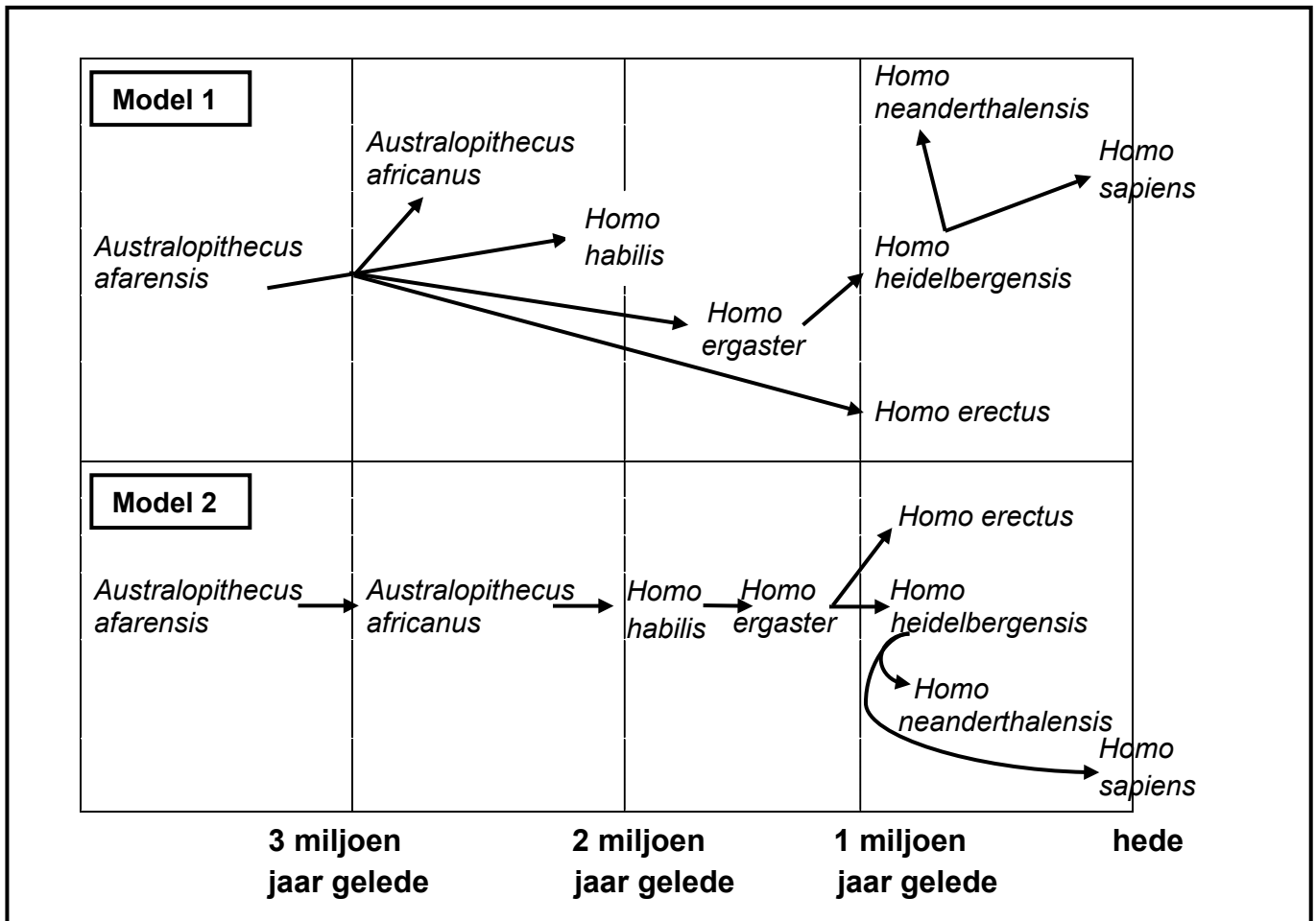
VRAAG 3

- 3.1 Talle cichlid-visspesies word in die Malawi-meer in Afrika aangetref. Al hierdie spesies het uit 'n enkele voorouerspesie ontwikkel. Die diagramme hieronder toon die monde van drie verskillende cichlid-visspesies wat deur simpatriese spesievorming in dieselfde meer in Malawi ontwikkel het. Dit gee ook inligting oor hul voedingsmetodes.



- 3.1.1 Noem EEN voordeel daarvan dat die drie cichlid-visspesies gespesialiseerde voeders is wat verskillende voedsel eet. (2)
- 3.1.2 Beskryf die proses wat tot die vorming van die drie spesies soos hierbo getoon, gelei het. (6)
(8)

3.2 Twee paleontoloë het verskillende modelle vir die evolusiestamboom van die mens voorgestel. Die modelle wat hulle voorgestel het, word hieronder getoon.



- 3.2.1 Noem TWEE ooreenkomste tussen die twee modelle ten opsigte van verwantskappe tussen die verskillende spesies. (2)
- 3.2.2 Beskryf TWEE maniere waarop die modelle verskil ten opsigte van verwantskappe tussen die verskillende spesies. (4)
- 3.2.3 Fossielskelette van *Australopithecus sediba* is in die Malapa-grotte ontdek. Toe wetenskaplikes die fossiele ontleed het, het hulle bevind dat dit sekere eienskappe met die genus *Homo* gemeen het.
Tussen watter TWEE spesies sal *Australopithecus sediba* in Model 2 geplaas word? (1)
- 3.2.4 Tabuleer TWEE strukturele eienskappe van die skedel wat die australopithecine van *Homo sapiens* onderskei. (5)

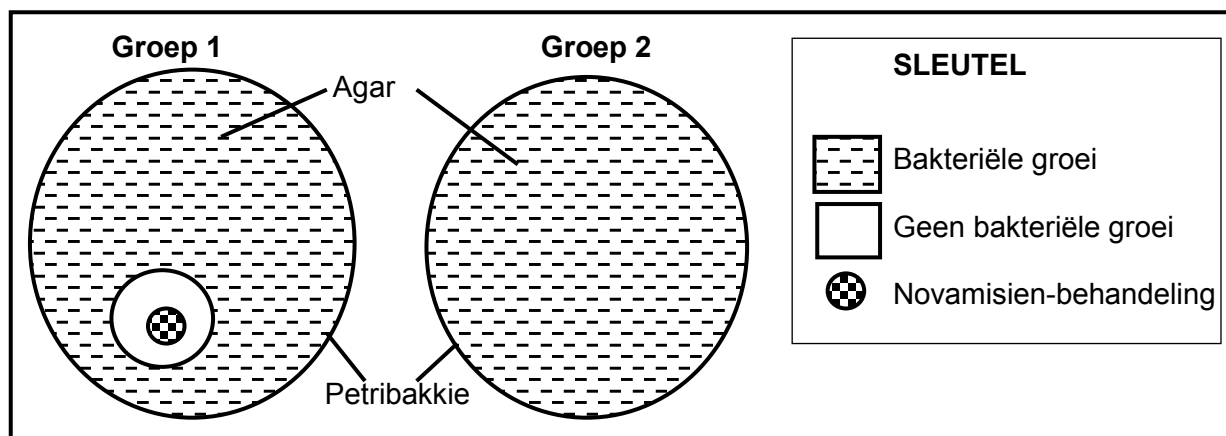
(12)



3.3 'n Wetenskaplike wou toets of 'n nuwe antibiotika, met die naam Novamisien, die voortplanting van 'n bevolking bakterieë wat vir ander antibiotika weerstandig was, kon beperk.

Die ondersoek is soos volg opgestel:

- Die bakterieë is in dieselfde tipe agarmedium in 20 petribakkies van dieselfde grootte gekweek en toe in 2 groepe ingedeel:
 - Groep 1: 10 petribakkies is met Novamisien van dieselfde konsentrasie behandel
 - Groep 2: 10 petribakkies het geen behandeling ontvang nie
- Die petribakkies is toe onder dieselfde toestande geïnkubeer en vir bakteriële groei ondersoek.
- Die diameter van die gebied waar geen bakterieë gegroei het nie, is vir elke petribakkie gemeet.



- 3.3.1 Vir die ondersoek hierbo, identifiseer:
- (a) Die afhanklike veranderlike (1)
 - (b) DRIE faktore wat gedurende die ondersoek konstant gehou moes gewees het, behalwe dié wat hierbo genoem is (3)
- 3.3.2 Waarom het die wetenskaplike meer as een petribakkie vir elke groep gebruik? (1)
- 3.3.3 Wat was die doel van Groep 2 in die ondersoek? (1)
- 3.3.4 'n Soortgelyke eksperiment is uitgevoer waar die gekweekte bakterieë in 5 groepe verdeel is. Hierdie groepe is toe met verskillende konsentrasies Novamisien behandel.
- (a) Formuleer 'n hipotese vir die ondersoek hierbo. (3)
 - (b) Noem EEN faktor wat verwant is aan Novamisien wat konstant gehou moet word. (1)

(10)
[30]

TOTAAL AFDELING B: 60



AFDELING C**VRAAG 4**

- 4.1 Die tabel hieronder toon die geboortemassa en die getal babas wat by die verskillende gewigte oorleef.

Geboortemassa (kg)	Getal babas wat oorleef
1,0–1,5	100
1,6–2,0	200
2,1–2,5	300
2,6–3,0	1 300
3,1–3,5	2 300
3,6–4,0	1 200
4,1–4,5	250
4,6–5,0	150

[Bron: *Basiese Genetika, 'n Menslike Benadering*, 1991]

- 4.1.1 Teken 'n histogram vir die inligting in die tabel hierbo. (7)
- 4.1.2 Noem die tipe oorerwing wat deur 'n groot getal gene, soos by geboortemassa, beheer word. (1)
- 4.1.3 Hoe verskil die tipe oorerwing wat in VRAAG 4.1.2 genoem is, van oorerwing as gevolg van 'n enkele geen? (2)
- (10)**

4.2 Lees die uittreksel hieronder en beantwoord die vrae wat volg.

DNS/DNA-TOETSING VAN VLEIS

Navorsing deur wetenskaplikes van die Universiteit van Stellenbosch het spore van donkie-, waterbuffel- en bokvleis in beesmaalvleismonsters gevind wat regoor die land geneem is.

Van die 139 monsters wat getoets is, het 95 (68%) spesies bevat wat nie op die produketiket aangedui is nie.

Wetenskaplikes van die Universiteit van Wes-Kaapland het DNS/DNA-toetse op 146 koedoebiltongmonsters gedoen. Die resultate het getoon dat 77% van die monsters verkeerd geëtiketteer is. In sekere gevalle het die monsters bees, kameelperd, kangeroe, sebra of vark bevat.

DNS/DNA-toetsing is duur, teen ongeveer R3 500 per monster.

[Aangepas uit *iol nuus*, Maart 2013]

- 4.2.1 Verduidelik hoe dit vir wetenskaplikes moontlik was om die verskillende spesies in die vleismonsters wat getoets is, te identifiseer. (2)
- 4.2.2 Gee TWEE redes waarom die biltongvervaardigers koedoe met bees- of varkvleis sou vervang. (2)
- 4.2.3 Verduidelik waarom behoorlike etikettering van die vleisprodukte vir sommige mense belangrik is. (2)
- 4.2.4 Gee EEN rede wat in die teks genoem word, waarom toetsing van die samestelling van vleisprodukte nie gereeld gedoen word nie. (1)
- 4.2.5 Gee EEN rede wat gebruik kan word om die DNS/DNA-resultate te betwis. (1)
- 4.2.6 Noem TWEE gebruike van DNS/DNA-profiel behalwe die een wat in die uittreksel genoem word. (2)
- 4.3 Begin met 'n sel wat VIER chromosome bevat en beskryf AL die chromosoomveranderinge wat gedurende meiose plaasvind en lei tot die vorming van abnormale gamete as gevolg van nie-disjunksie (nie-verdeling) in meiose 1. (17)
- Inhoud (17)
Sintese (3)
(20)

LET WEL: GEEN punte sal toegeken word vir antwoorde in die vorm van vloeddiagramme of diagramme nie.

TOTAAL AFDELING C: 40
GROOTTOTAAL: 150



4.2

Read the extract below and answer the questions that follow.

DNA TESTING OF MEAT

Research by Stellenbosch University scientists found traces of donkey, water buffalo and goat meat in beef mince samples taken from across the country.

Of the 139 samples tested, 95 (68%) contained species which were not indicated on the product labelling.

Scientists at the University of the Western Cape did DNA tests on 146 kudu mislabelled. In some cases the samples contained beef, giraffe, kangaroo, zebra or pork.

DNA testing is expensive, at around R3 500 per sample.

[Adapted from *iol news*, March 2013]

4.2.1 Explain how it was possible for scientists to identify the different species in the meat samples tested. (2)

4.2.2 Give TWO reasons why the bitong manufacturers would substitute kudu with beef or pork. (2)

4.2.3 Explain why the proper labelling of the meat products is important to some people. (2)

4.2.4 Give ONE reason mentioned in the text why testing for the composition of meat products is not done regularly. (1)

4.2.5 Give ONE reason that can be used to dispute the DNA results. (1)

4.2.6 State TWO uses of DNA profiling other than the one mentioned in the extract. (2)

4.3

Start with a cell containing FOUR chromosomes and describe ALL the chromosomal changes that occur during meiosis, resulting in the formation of abnormal gametes due to non-disjunction in meiosis 1.

Content (17)

NOTE: NO marks will be awarded for answers in the form of flow charts or diagrams.

(17)
(3)
(20)

TOTAL SECTION C:

40

GRAND TOTAL:

150



QUESTION 4**SECTION C**

4.1 The table below shows the birth weight and the number of babies that survive at the different weights.

Birth weight (kg)	Number of babies surviving
1,0–1,5	100
1,6–2,0	200
2,1–2,5	300
2,6–3,0	1 300
3,1–3,5	2 300
3,6–4,0	1 200
4,1–4,5	250
4,6–5,0	150

[Source: *Basic Genetics, A Human Approach*, 1991]

4.1.1 Draw a histogram using the information in the table above. (7)

4.1.2 Name the type of inheritance that is controlled by many genes, such as in birth weight. (1)

4.1.3 How is the type of inheritance mentioned in QUESTION 4.1.2 different from that of inheritance due to one gene? (2)

(10)

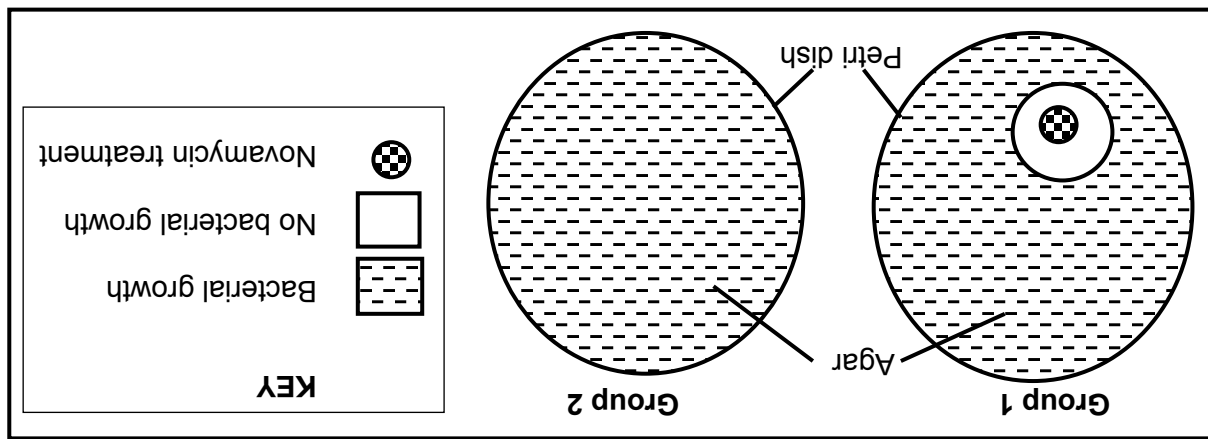


3.3

A scientist wanted to test whether a new antibiotic, called Novamycin, could restrict the reproduction of a population of bacteria which was resistant to other antibiotics.

The investigation was set up as follows:

- The bacteria were cultured in the same type of agar medium in 20 petri dishes of the same size and then divided into 2 groups:
 - Group 1: 10 petri dishes were treated with Novamycin of the same concentration
 - Group 2: 10 petri dishes were given no treatment
- The petri dishes were then incubated under the same conditions and examined for bacterial growth.
- The diameter of the area where no bacteria grew, was measured for each petri dish.



3.3.1 For the investigation above identify:

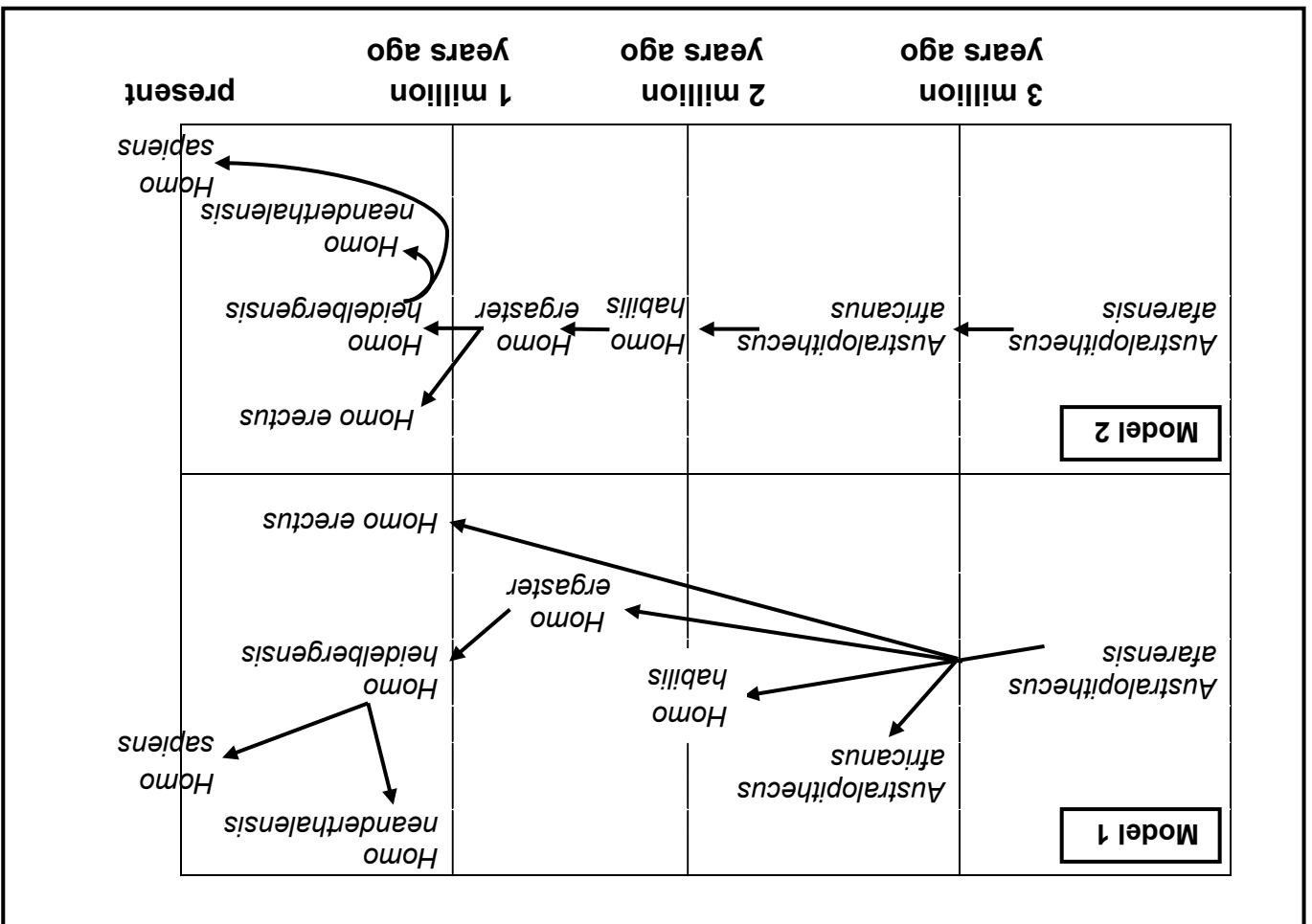
- (a) The dependent variable
 - (b) THREE factors that should have been kept constant during the investigation, other than those mentioned above
- 3.3.2 Why did the scientist use more than one petri dish in each group? (1)
- 3.3.3 What was the purpose of Group 2 in the investigation? (1)
- 3.3.4 A similar experiment was done in which the cultured bacteria were divided into 5 groups. These groups were then treated with different concentrations of Novamycin.
- (a) Formulate a hypothesis for the above investigation. (3)
 - (b) State ONE factor related to Novamycin that must be kept constant. (1)

TOTAL SECTION B: 60

**[30]
(10)**



3.2 Two palaeontologists suggested different models for the human evolutionary tree. The models they proposed are shown below.



3.2.1 State TWO similarities between the two models with regard to relationships among the different species. (2)

3.2.2 Describe TWO ways in which the models are different with regard to relationships among the different species. (4)

3.2.3 Fossilised skeletons of *Australopithecus sediba* were discovered in the Malapa Caves. When scientists analysed the fossils, they discovered that they shared some characteristics with the genus *Homo*. (1)

Between which TWO species would *Australopithecus sediba* be placed in Model 2?

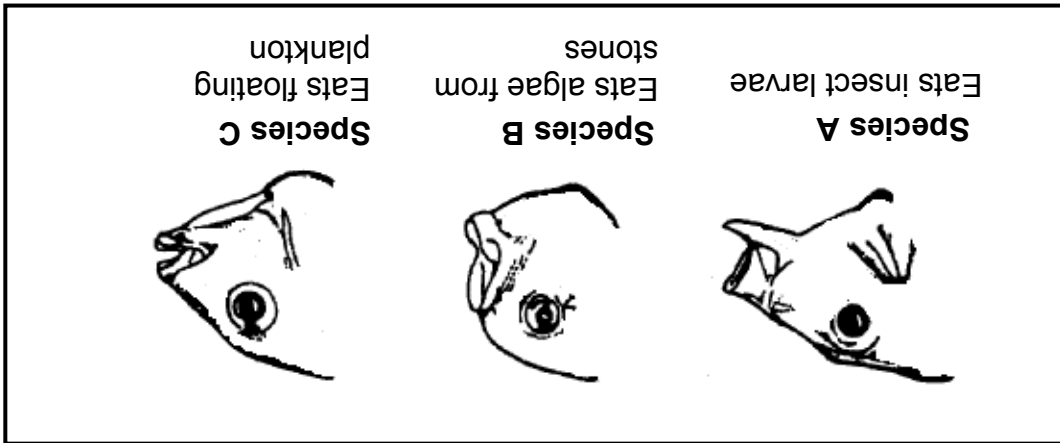
3.2.4 Tabulate TWO structural features of the skull that would distinguish the australopithecines from *Homo sapiens*. (5)

(12)



QUESTION 3

3.1 Many species of cichlid fish are found in Lake Malawi in Africa. All these species have evolved from a single ancestral species. The diagrams below show the mouths of three different cichlid fish species formed through sympatric speciation in the same lake in Malawi. It also gives information about their feeding methods.



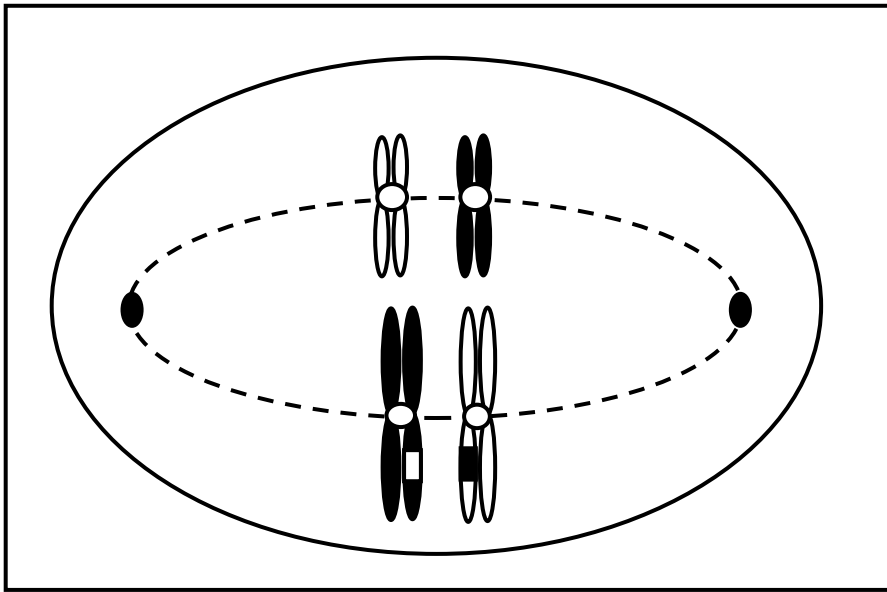
- 3.1.1 State ONE advantage of the three cichlid species being specialised feeders, eating different types of food. (2)
- 3.1.2 Describe the process that led to the formation of the three species shown above. (6)

(8)



2.4

The diagram represents a cell at metaphase of meiosis I.



Draw a fully labelled diagram to represent ONE of the resulting cells at the same phase of meiosis II.

[7]
[30]



2.2

Cystic fibrosis is a genetic disorder characterised by an abnormal production of mucus in the lungs of humans. It is caused by a mutation in a gene on chromosome 7 that codes for the protein CFTR. The protein CFTR is made up of 1 480 amino acids. The normal sequence and the mutated part of the gene are shown below.

Sequence	Base triplets of the nitrogenous bases						
Normal	ATT	ATC	ATT	GGT	GTT	TCC	
Mutated	ATT	ATC	TTT	GGT	GTT	TCC	

2.2.1 How do we know that the base triplets represented are those of DNA? (1)

2.2.2 Name the type of gene mutation represented by the information in the table above. (1)

2.2.3 Explain the effect of the gene mutation named in QUESTION 2.2.2. (4)

2.3

The inheritance of fur colour in cats is sex-linked. The tortoise-shell colour of cats is a combination of black and orange fur. The allele for black fur is represented by X^O and the allele for orange fur is represented by X^o .
A female cat with a tortoise-shell colour mates with an orange male cat.
HINT: The sex chromosomes/gonosomes in cats are the same as in humans.

2.3.1 Use the symbols X^B , X^o and Y to represent a genetic cross of the mating stated above. Also indicate the proportion of the F_1 phenotypes. (7)

2.3.2 Explain why the male kittens can never have the tortoise-shell colour. (2)

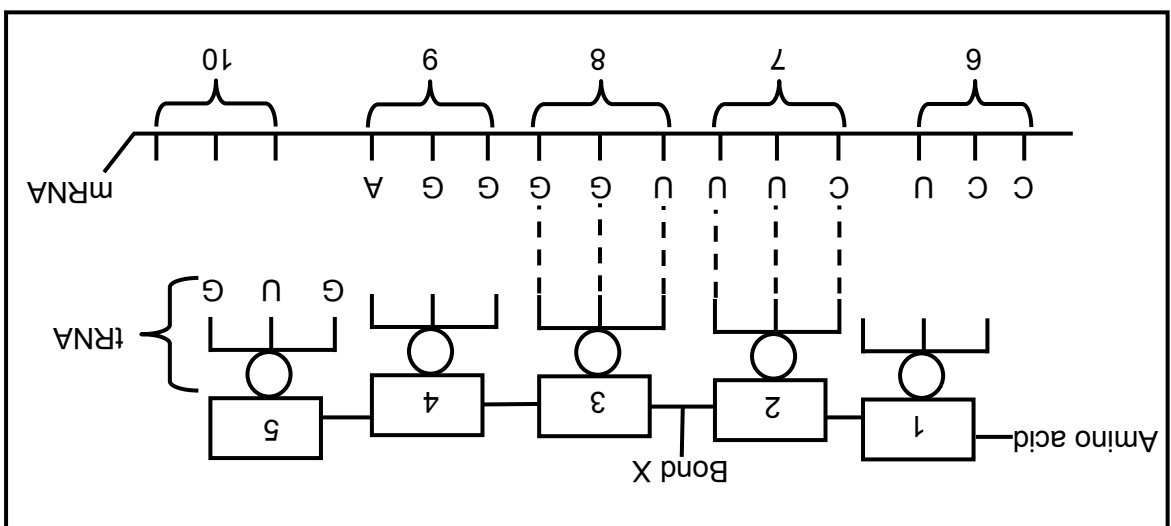
2.3.3 Explain why the female kittens can have the tortoise-shell colour. (2)

(11)



SECTION B
QUESTION 2

2.1 Study the diagram below, which shows a stage in protein synthesis.



2.1.1 Name the stage in protein synthesis represented by the diagram above. (1)

2.1.2 Write down the DNA base triplets that correspond to the codons numbered 6 and 10. (2)

2.1.3 Name: (1)

(a) The bond represented by X (1)

(b) The organelle in which the process represented in the diagram above takes place (1)

2.1.4 The table below shows the amino acids coded for by various tRNA anticodons. (1)

Anticodons on tRNA	Amino acid coded for
CCU	Proline
GAA	Glutamate
GGA	Glycine
CUU	Leucine
GUU	Histidine
GUU	Valine
ACC	Threonine
CAC	Valine
UGG	Tryptophan

Use the information in the table above and:

(a) Write down the names of the amino acids coded for by the codons numbered 7 and 9 (2)

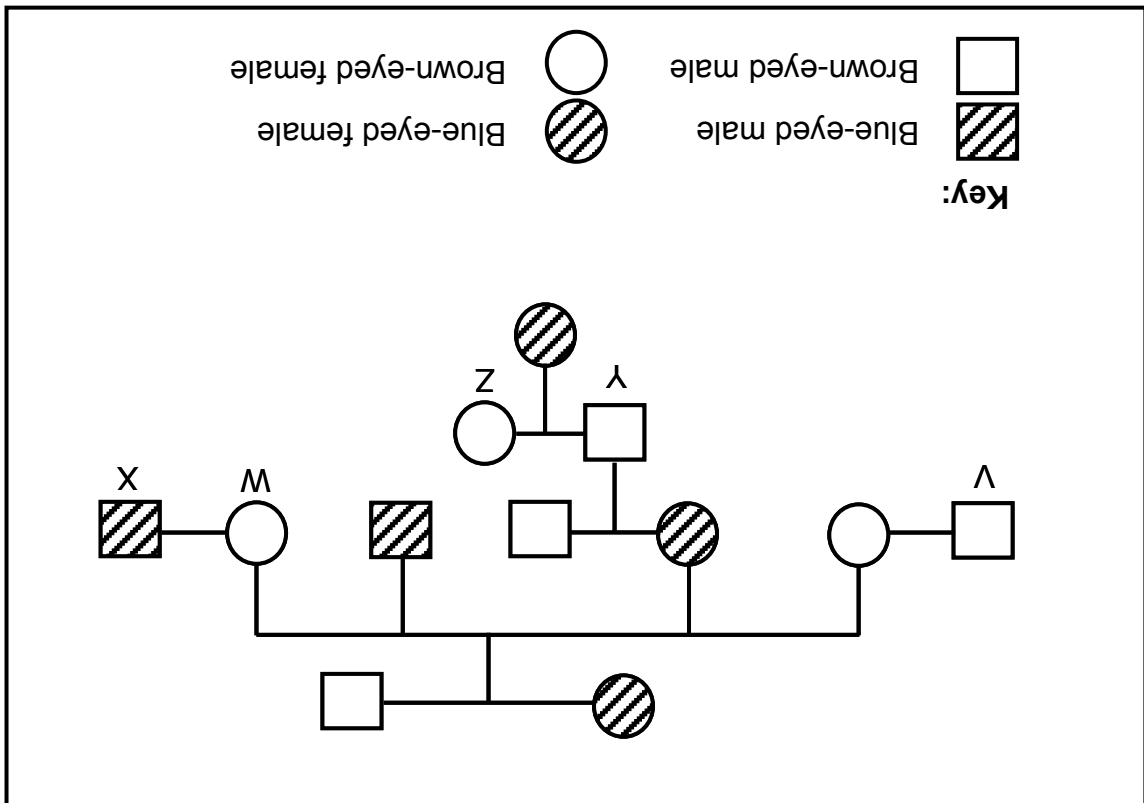
(b) Identify amino acid 5 (1)

(8)



1.4

In humans, the allele for brown eye colour (B) is dominant over the allele for blue eye colour (b). A scientist collected information about the inheritance of eye colour in a certain family. The information obtained is represented in the pedigree diagram below.



QUESTIONS 1.4.1 and 1.4.2 refer to the following possible answers (i, ii, iii, iv). Write only the number (i, ii, iii or iv) next to the question number (1.4.1–1.4.2).

- (i) They have the same phenotype and the same genotype.
- (ii) They differ in phenotype, but have the same genotype.
- (iii) They have the same phenotype, but differ in genotype.
- (iv) They differ in both phenotype and genotype.

1.4.1 If person V is homozygous for the dominant eye colour allele, then which of the above statements is TRUE about person V and person W?

1.4.2 Which of the statements above is TRUE about person Y and person Z?

1.4.3 What is the percentage chance of person W and person X having a blue-eyed child?

TOTAL SECTION A: 50

(6)
(2)

(2)

(2)



1.2

Give the correct **biological term** for each of the following descriptions. Write only the term next to the question number (1.2.1 to 1.2.8) in the ANSWER BOOK.

- 1.2.1 An inherited disease that affects haemoglobin and changes the shape of red blood corpuscles
- 1.2.2 The genetic make-up of an organism in respect of the alleles it possesses
- 1.2.3 The complete disappearance of a species from Earth
- 1.2.4 The full complement of genes present in an organism
- 1.2.5 The ability of an organism to walk on two feet
- 1.2.6 The chromosome complement/condition of a body cell which contains two sets of chromosomes
- 1.2.7 The point at which chromatids of homologous chromosomes cross over during meiosis
- 1.2.8 A visual representation of an organism's chromosomes

(8)

1.3

Indicate whether each of the statements in COLUMN I applies to **A ONLY**, **B ONLY**, **BOTH A AND B** or **NONE** of the items in COLUMN II. Write **A only**, **B only**, **both A and B** or **none** next to the question number (1.3.1 to 1.3.8) in the ANSWER BOOK.

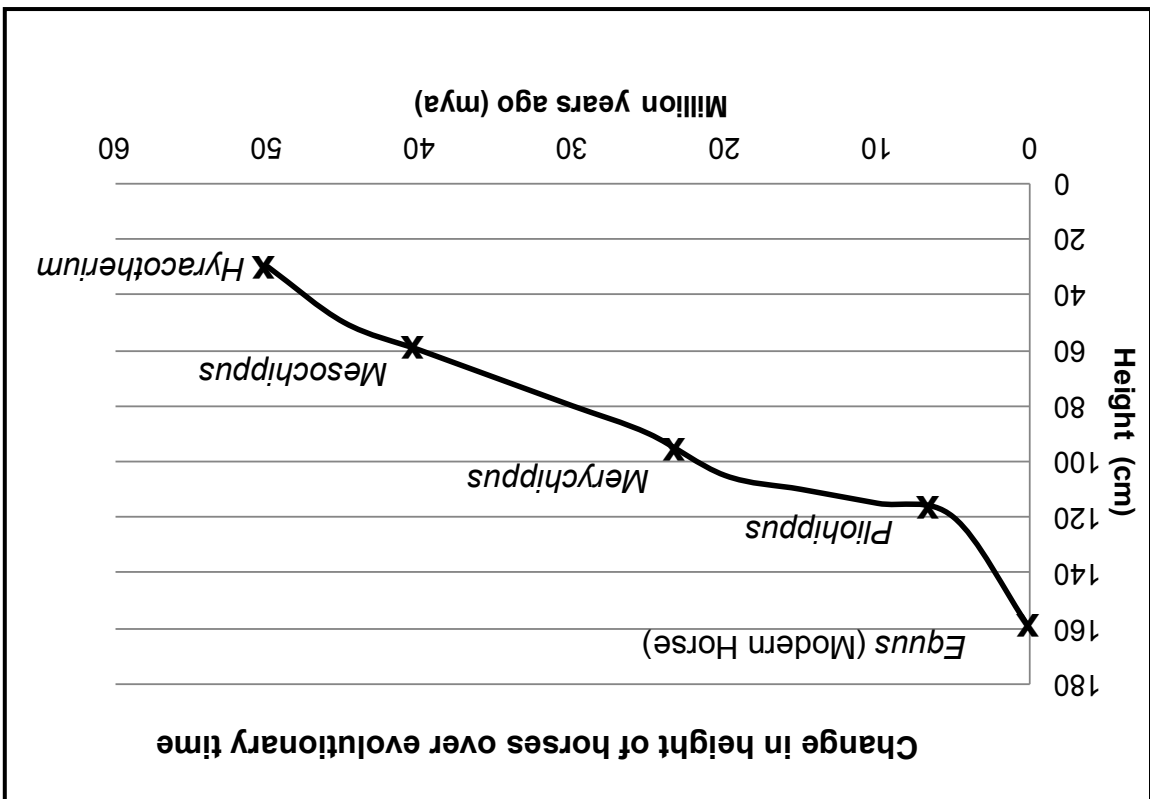
COLUMN I	COLUMN II
1.3.1 Characteristics are inherited from the parents by the offspring	A: Lamarck's observation B: Darwin's observation
1.3.2 Causes of variation during meiosis	A: Random fertilisation B: Random mating
1.3.3 Provides evidence for common ancestry	A: Homologous structures B: Analogous structures
1.3.4 Book published by Darwin	A: <i>HMS Beagle</i> B: <i>On the Origin of Species</i>
1.3.5 Reproductive isolation mechanism	A: Courtship behaviour B: Breeding at the same time
1.3.6 Fossils found in South Africa	A: Mrs Ples B: Lucy
1.3.7 Genetic evidence for the 'Out of Africa' hypothesis	A: DNA from the X-chromosome B: DNA from ribosomes
1.3.8 Increases variation in a species	A: Cloning B: Mutation

(8 x 2)

(16)



1.1.10 The graph below shows the changes in the height of horses over evolutionary time.



[Adapted from *Biology*, Jones and Jones, 1993]

What can be reasonably concluded from the graph above?

- A The increase in height was caused by climatic change.
- B The height of the horse varied over time.
- C *Mesochippus* was taller than *Merychippus*.
- D In 100 years' time, the horse will be significantly taller than horses today.

(20) (10 x 2)



1.1.8 After observing a certain phenomenon a scientist can formulate a/an ...

- A theory.
- B hypothesis.
- C fact.
- D law.

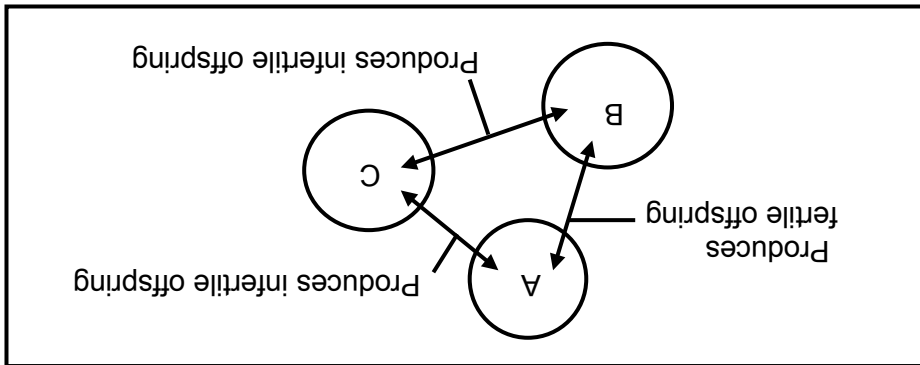
1.1.9 Genes in organisms can be manipulated by human beings in order to produce useful substances. One example of a useful substance produced in this way is the human protein insulin, which is used to treat diabetes.

Which ONE of the following accurately describes how human insulin can be produced and used to treat diabetes?

- A Take insulin from bacteria and place it in a human being, thus enabling the human being to produce insulin.
- B Take insulin genes from bacteria and place them in a human being, thus enabling the human being to produce insulin.
- C Take insulin genes from a human being and place them in bacteria. Use the insulin produced by the bacteria to treat diabetes.
- D Take insulin from a human being and grow it in bacteria. Use the insulin produced by the bacteria to treat diabetes.



1.1.5 The diagram below shows the fertility of the offspring produced when three populations of mice, **A**, **B** and **C**, interbreed.



Which ONE of the following statements about populations **A**, **B** and **C** is the CORRECT interpretation of the information in the diagram above?

- A All three populations are of the same species.
- B Populations A and C are of the same species, but populations A and B are different species.
- C Populations B and C are different species, but populations A and B are of the same species.
- D Populations A and B are different species, but populations B and C are of the same species.

1.1.6

In humans the allele for blood group A is dominant to the allele for blood group O. Two parents both have blood group A. Their child has blood group O.

What is the best explanation of this pattern of inheritance?

- A The child has inherited the blood group directly from a grandparent.
- B The parents are homozygous for the blood group alleles.
- C The parents are heterozygous for the blood group alleles.
- D There has been a mutation in the blood group alleles.

1.1.7

In an investigation it was found that 10% of the bases in a molecule of DNA were thymine. What was the ratio of thymine to guanine in the same molecule?

- A 1 : 2
- B 1 : 3
- C 1 : 1
- D 1 : 4



SECTION A
QUESTION 1

1.1 Various options are given as possible answers to the following questions. Choose the correct answer and write only the letter (A to D) next to the question number (1.1.1 to 1.1.10) in the ANSWER BOOK, for example 1.1.11 D.

1.1.1 A gradual change in the structure of organisms over time is known as ...

- A evolution.
- B a mutation.
- C protein synthesis.
- D natural selection.

1.1.2 The following are statements relating to evolution:

- (i) Artificial selection and metamorphosis show how evolution in organisms may have occurred.
- (ii) There are similarities among various organisms.
- (iii) Use or disuse of an organ results in it being modified.
- (iv) All life forms develop from simple forms.

Which combination of statements relates to ideas on evolution proposed by Erasmus Darwin?

- A (i), (ii), (iii) and (iv)
- B (ii), (iii) and (iv)
- C (i), (ii) and (iv)
- D (i), (iii) and (iv)

1.1.3 Which ONE of the following is the result of artificial selection?

- A DDT resistance in mosquitoes
- B Decreasing effect of antibiotics on bacteria
- C Increased milk yield in dairy cattle
- D Peppered moths not being detected by predators

1.1.4 Which of the following represents ONE advantage and ONE disadvantage of genetic engineering in developing desirable products?

Advantage	Disadvantage
A Increased rate of production	Cost of development is high
B Cost of development is high	Possible release of the GMO into the environment
C Increased range of products	Increased rate of production
D Increased rate of production	Increased range of products



INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. Answer ALL the questions.
2. Write ALL the answers in the ANSWER BOOK.
3. Start the answers to EACH question at the top of a NEW page.
4. Number the answers correctly according to the numbering system used in this question paper.
5. Present your answers according to the instructions of each question.
6. Do ALL drawings in pencil and label them in blue or black ink.
7. Draw diagrams or flow charts only when asked to do so.
8. The diagrams in this question paper are NOT necessarily drawn to scale.
9. Do NOT use graph paper.
10. You must use a non-programmable calculator, a protractor and a compass where necessary.
11. Write neatly and legibly.





MORNING SESSION

This question paper consists of 16 pages.

TIME: 2½ hours

MARKS: 150

FEBRUARY/MARCH 2014

LIFE SCIENCES P1

(LFSC.1)

GRADE 12

NATIONAL
SENIOR CERTIFICATE

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

basic education

