



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**NASIONALE
SENIOR SERTIFIKAAT**

GRAAD 12

LFSC.2

LEWENSWETENSKAPPE V2

FEBRUARIE/MAART 2017

PUNTE: 150

TYD: 2½ uur

Hierdie vraestel bestaan uit 16 bladsye.

OGGENDSESSIE



INSTRUKSIES EN INLIGTING

Lees die volgende instruksies aandagtig deur voordat jy die vrae begin beantwoord.

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 is.
5. Bied jou antwoorde volgens die instruksies by elke vraag aan.
6. Maak ALLE sketse met potlood en die byskrifte met blou of swart ink.
7. Teken diagramme, vloedigramme of tabelle 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, gradeboog en 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. Skryf die vraagnommer (1.1.1–1.1.8) neer, kies die antwoord en maak 'n kruisie (X) oor die letter (A–D) van jou keuse in die ANTWOORDEBOEK.

VOORBEELD:

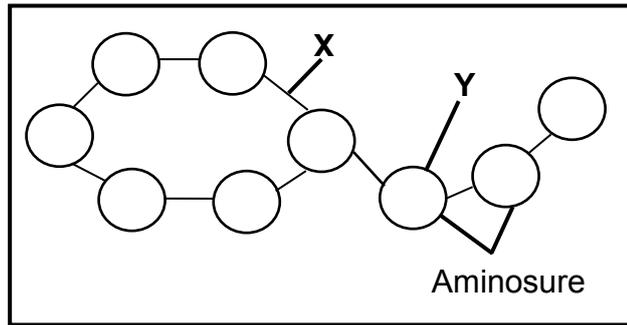
1.1.9

 A B C D

- 1.1.1 Die proses waar een DNS/DNA-molekuul twee identiese DNS/DNA-molekule vorm, word ... genoem.
- A voortplanting
 - B replisering
 - C translasie
 - D proteïensintese
- 1.1.2 'n Verskil tussen DNS/DNA en RNS/RNA:
- A RNS/RNA is dubbelgestring en DNS/DNA is enkelgestring.
 - B DNS/DNA het 'n suikerfosfaat-raamwerk, maar RNS/RNA het nie.
 - C Daar is swak waterstofbindings in DNS/DNA, maar nie in RNS/RNA nie.
 - D RNS/RNA het 'n heliksstruktuur en DNS/DNA is reguit.
- 1.1.3 'n Stamboomdiagram toon ...
- A hoe organismes ontwikkel.
 - B die oorerwing van kenmerke oor baie generasies.
 - C slegs geslagsgekoppelde kenmerke.
 - D slegs die getal kinders in 'n familie.
- 1.1.4 'n Rooi blomplant word gekruis met 'n wit blomplant. Die nageslag het almal pienk blomme. Wanneer die twee pienk blomplante gekruis word, sal die volgende geslag blomplante blomme hê wat ...
- A slegs pienk is.
 - B slegs rooi is.
 - C slegs wit is.
 - D pienk, rooi en wit is.



1.1.5 Die diagram hieronder toon die chemiese struktuur van 'n proteïen.



X verteenwoordig 'n ...

- A waterstofbinding.
- B stikstofbasis.
- C peptiedbinding.
- D bRNS/mRNA-molekuul.

1.1.6 Die verskil tussen nukleïensure en nukleotiede is dat ...

- A nukleïensure boustene van nukleotiede is.
- B nukleotiede boustene van nukleïensure is.
- C nukleotiede groter as nukleïensure is.
- D nukleïensure in die nukleus gevind word en nukleotiede in die sitoplasma.

1.1.7 Watter EEN van die volgende gebeure vind tydens metafase I van meiose plaas?

- A Homoloë chromosome rangskik hulself op die ewenaar
- B Sentriole beweeg na die teenoorgestelde pole
- C Chromosome rangskik hulself een vir een op die ewenaar
- D Verdelling van die sitoplasma

1.1.8 Die aminosuurvolgordes in 'n proteïen tussen die mens en 'n aantal ander organismes is vergelyk. Die getal verskille word in die tabel hieronder getoon.

ORGANISME	HAAI	KANGAROE	VIS	KOEI	AKKEDIS
Getal verskille in aminosuurvolgordes in 'n proteïen, in vergelyking met die mens	79	27	68	17	62

[Aangepas uit AQA Biology 1998]

Die tipe bewys vir evolusie in die tabel hierbo is ...

- A fossielbewyse.
- B biogeografie.
- C kulturele bewyse.
- D genetiese bewyse.

(8 x 2) (16)



1.2 Gee die korrekte **biologiese term** vir elk van die volgende beskrywings. Skryf slegs die term langs die vraagnommer (1.2.1 tot 1.2.7) in die ANTWOORDEBOEK neer.

- 1.2.1 'n Skielike verandering in die volgorde van stikstofbassisie van 'n nukleïensuur
- 1.2.2 Verduideliking vir 'n waarneming wat ondersteun word deur feite, modelle en wette
- 1.2.3 Die teling van organismes oor baie generasies om 'n gewenste fenotipe te verkry
- 1.2.4 Die tipe suiker wat in 'n RNS/RNA-molekuul gevind word
- 1.2.5 Tipe evolusie wat lang tydperke behels wanneer geen verandering in die spesie plaasvind nie en dan kort tydperke van vinnige veranderings
- 1.2.6 Die hipotese wat die migrasie van die mens se oerouers vanaf die punt van oorsprong ondersteun
- 1.2.7 Die gemineraliseerde oorblyfsels van organismes wat in die verlede geleef het (7 x 1) **(7)**

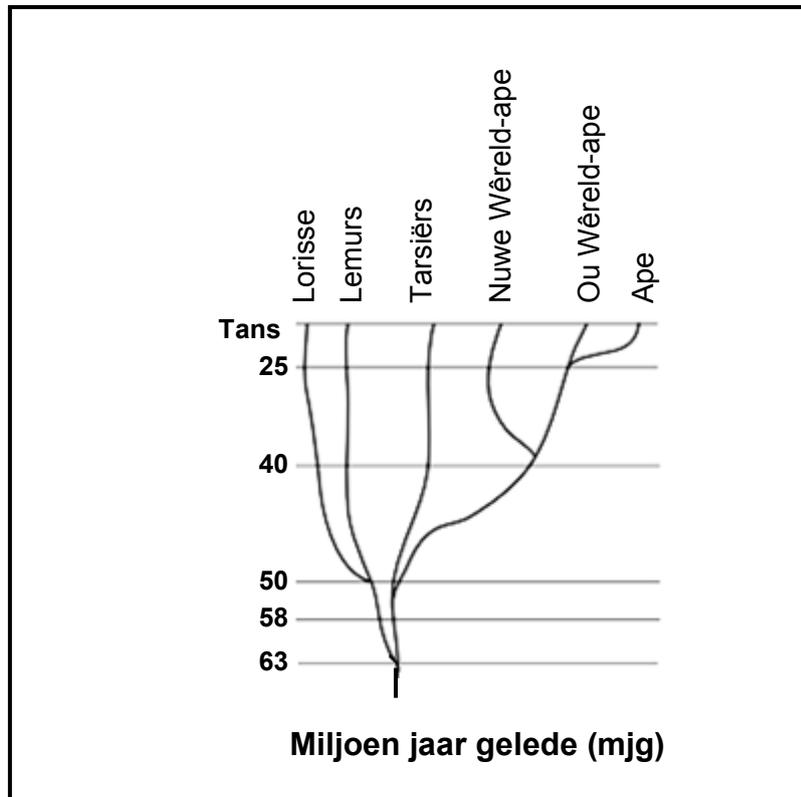
1.3 Dui aan of elk van die beskrywings in KOLOM I van toepassing is op **SLEGS A, SLEGS B, BEIDE A EN B** of **GEENEEN** van die items in KOLOM II nie. Skryf **slegs A, slegs B, beide A en B** of **geeneen** langs die vraagnommer (1.3.1 tot 1.3.3) in die ANTWOORDEBOEK neer.

KOLOM I		KOLOM II	
1.3.1	Vind tydens telofase van meiose I plaas	A:	Verdeling van die sitoplasma
		B:	Sentriole beweeg na die teenoorgestelde pole
1.3.2	Posisie van DNS/DNA	A:	Nukleus
		B:	Mitochondria
1.3.3	Word in Afrika-ape en die mens gevind	A:	Kloue in plaas van naels
		B:	'n Opponeerbare duim

(3 x 2) **(6)**



- 1.4 Die diagram hieronder toon moontlike evolusionêre verwantskappe tussen primate.

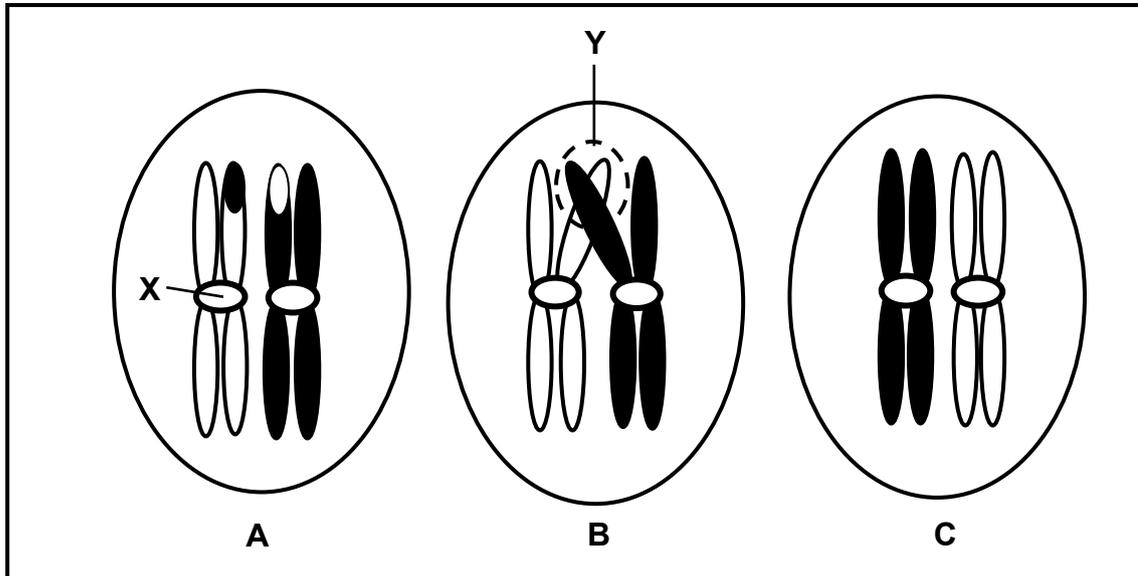


[Bron: <http://dl0.creation.com/articles>]

- 1.4.1 Hoeveel miljoen jaar gelede het die:
- Ape op Aarde verskyn (1)
 - Gemeenskaplike voorouer ontwikkel om die Tarsiërs en Lemurs te vorm (1)
- 1.4.2 Watter TWEE spesies deel die mees onlangse gemeenskaplike voorouer? (2)
- 1.4.3 Watter spesie is die naaste verwant aan die Lemur? (1)
- (5)**



- 1.5 Die diagramme hieronder stel 'n chromosoompaar in 'n vroulike sel van die mens voor. Die selle (**A**, **B** en **C**) toon verskillende gebeure in 'n fase van meiose, wat nie noodwendig in die korrekte volgorde is nie.



- 1.5.1 Hoeveel paar chromosome kom in 'n normale sel van die mens voor? (1)
- 1.5.2 Gee byskrifte vir:
- (a) Struktuur **X** (1)
- (b) Gebied **Y** (1)
- 1.5.3 Noem die orgaan in die vroulike liggaam waar meiose plaasvind. (1)
- 1.5.4 Noem die:
- (a) Proses wat in diagram **B** plaasvind (1)
- (b) Fase wat deur die diagramme hierbo verteenwoordig word (1)
- (c) Tipe sel wat die gevolg sal wees van meiose van hierdie sel (1)
- 1.5.5 Rangskik die letters **A**, **B** en **C** om die korrekte volgorde van die gebeure te toon. (1)
- (8)**



- 1.6 Pelskleur by muis word deur twee allele, swart (**B**) en grys (**b**), beheer. Stertlengte word deur twee allele, lank (**T**) en kort (**t**), beheer.

Die Punnett-vierkant hieronder toon 'n gedeelte van die kruising tussen twee muis. Genotipe (**i**) is uitgelaat.

		Ouer 1			
		Gamete	BT	Bt	bT
Ouer 2	Bt	BBTt	BBtt	BbTt	Bbtt
	Bt	BBTt	BBtt	BbTt	Bbtt
	Bt	BBTt	BBtt	(i)	Bbtt
	Bt	BBTt	BBtt	BbTt	Bbtt

- 1.6.1 Gee die:
- (a) Genotipe van ouer 1 (2)
 - (b) Fenotipe van ouer 2 (2)
 - (c) Genotipe van nageslag (**i**) (1)
- 1.6.2 Watter persentasie van die nageslag hierbo is grys met kort sterte? (1)
- 1.6.3 Noem die genotipes van TWEE gamete uit die tabel hierbo, wat 'n nageslag tot gevolg sal hê wat heterosigoties vir beide kenmerke sal wees as bevrugting plaasvind. (2)

(8)

TOTAAL AFDELING A: 50

AFDELING B**VRAAG 2**

2.1 Lees die uittreksel hieronder.

NUWE HOMINIEN-SPESIE ONTDEK

Wetenskaplikes het op 13 September 2013 fossiele in die Sterkfonteingrotte in Suid-Afrika ontdek, wat vermoedelik aan 'n voorheen onbekende spesie hominiene behoort het.

Die fossiele is as 'n nuwe spesie, *Homo naledi*, geklassifiseer. Die fisiese kenmerke van *H. naledi* word beskryf dat hulle kenmerke het wat ooreenstem met die genus *Australopithecus*, gemeng met kenmerke wat meer kenmerkend is van die genus *Homo*. *H. naledi* is vermoedelik 'n oorgangsfossiel.

'n Analise van *H. naledi* se skelet toon dat dit regop kon staan en tweevoetig was. Die struktuur van die pelvis is soortgelyk aan die *Australopithecines*, maar sy bene, voete en enkels stem meer ooreen met die genus *Homo*.

Vier skedels is ontdek, elk met ongeveer die helfte van die volume van die moderne skedels van die mens. Die *H. naledi*-skedels is nader aan die kraniumvolume van die skedel van die *Australopithecus*, maar die kraniumstruktuur stem meer ooreenstem met dié gevind in die genus *Homo*.

Die tande is baie kleiner as dié van *Australopithecus* en soortgelyk aan die tande van die moderne mens.

[Aangepas uit <https://humanorigins.si.edu/evidence>]

- 2.1.1 Definieer die term *oorgangsfossiel*. (2)
- 2.1.2 Noem 'n kenmerk in die uittreksel wat *Homo naledi* met beide *Australopithecus* en *Homo* gedeel het. (1)
- 2.1.3 Noem EEN ander kenmerk in die uittreksel wat *Homo naledi* slegs met *Australopithecus* gedeel het. (1)
- 2.1.4 Verduidelik TWEE kenmerke van 'n geraamte wat aanpassings vir tweevoetigheid is. (4)
- 2.1.5 Gee EEN moontlike rede waarom daar 'n verandering na kleiner tande by die moderne mens was. (3)
- (11)**



- 2.2 Bestudeer die tabel hieronder wat die verandering in antibiotiese weerstandigheid in drie stamme bakterieë (MRSA, VRE en FQRP) oor 'n tydperk van 20 jaar toon.

JAAR	ANTIBIOTIESE WEERSTANDIGHEID (%)		
	MRSA	VRE	FQRP
1981	2	0	0
1985	10	0	0
1989	15	2	0
1993	40	5	5
1997	40	20	10
2001	60	20	25

[Bron: <http://wallace.genetics.uga.edu/groups/evol>]

- 2.2.1 Watter bakteriestam was die:
- (a) Meeste weerstandig teen antibiotika oor die jare (1)
 - (b) Laaste om weerstandigheid teen antibiotika te ontwikkel (1)
- 2.2.2 Bereken die persentasie toename vanaf 1993 tot 1997 in antibiotiese weerstandigheid by VRE. (3)
- 2.2.3 Trek 'n lyngrafiek om die ontwikkeling van antibiotiese weerstandigheid by die bakteriestam MRSA te toon. (6)
(11)



- 2.3 Die diagram hieronder toon stikstofbasis-volgordes vir 'n gedeelte van 'n nukleïensuur wat vir die vervaardiging van insulien kodeer. Insulien is nodig vir die opname van suiker uit die bloed.

Die volgordes hieronder is van twee individue en word van links na regs gelees. Volgorde **1** is van 'n normale persoon en volgorde **2** is van 'n persoon wat 'n mutasie toon en nie insulien kan vervaardig nie.

TWEË STIKSTOFBASIS-VOLGORDES VAN 'N DEEL VAN 'N NUKLEÏENSUUR									
Volgorde 1	TAG	CCA	CAC	GTT	ACA	ACG	TGA	AGG	TAA
Volgorde 2	TAT	CCA	CAC	GTT	ACA	ACG	TGA	AGG	TAA

[Bron: www.biologyjunction.com]

- 2.3.1 Watter nukleïensuur word in beide volgordes verteenwoordig? (1)
- 2.3.2 Waar het die mutasie in die tweede volgorde voorgekom? (1)

Die tabel hieronder toon die aminosure waarvoor gekodeer is deur verskillende DNA-basisdrietalte.

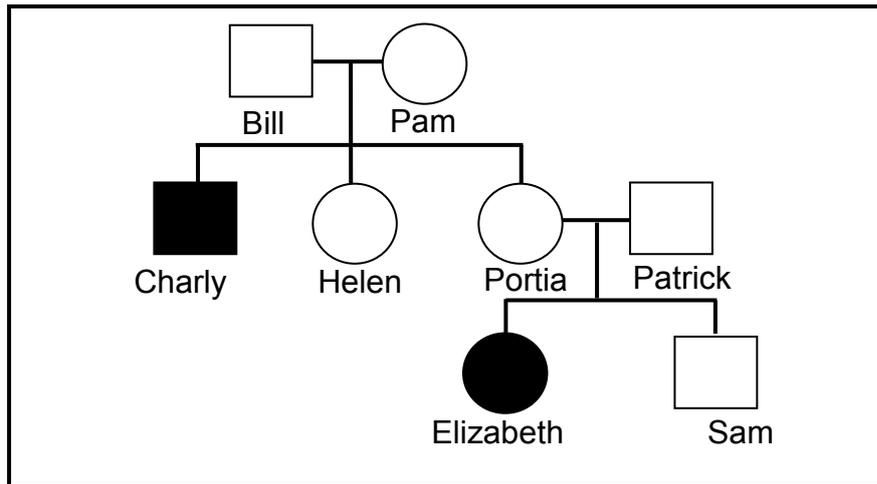
AMINOSUUR	DNA-BASISDRIETAL
Glisien	CCG
	CCT
	CCC
Valien	CAT
	CAC
Histidien	GTA
	GTG
Prolien	GGA
	GGC
Isoleusien	TAA
	TAT

- 2.3.3 Gee die:
- (a) Antikodon van die vierde basisdrietal op volgorde **2** (2)
- (b) Aminosuur waarvoor gekodeer is deur die eerste basisdrietal in volgorde **2** (2)
- (6)
- 2.4 Beskryf die proses van *transkripsie in proteïensintese*. (4)



2.5 Tay-Sachs-siekte word deur 'n outosomale resessiewe alleel (**n**) veroorsaak. Kinders met Tay-Sachs-siekte verloor hul motoriese vaardighede en verstandelike funksies. Die kinders word mettertyd blind, doof, verstandelik vertraag en verlam. Tay-Sachs-kinders sterf op die ouderdom van vyf jaar.

Die stamboomdiagram hieronder toon die oorerwing van Tay-Sachs-siekte in 'n familie.



[Bron: www.tay-sachs.org]

2.5.1 Gee:

- (a) Charly se fenotipe (2)
- (b) Portia se genotipe (2)
- (c) Bill se genotipe (2)

2.5.2 Verduidelik waarom Patrick normaal is, maar 'n draer is van Tay-Sachs-siekte.

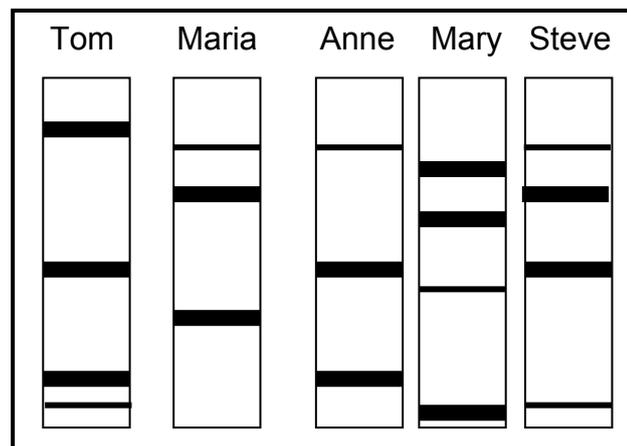
(2)
(8)
[40]



VRAAG 3

- 3.1 Tom en Maria het drie kinders. Een van die drie kinders is aangeneem. 'n DNA-profiel is vir elke familielid voorberei om te bepaal of Tom al drie kinders (Anne, Mary en Steve) se pa is.

Die DNA-profiel word hieronder gegee.



- 3.1.1 Watter EEN van die kinders is aangeneem? (2)
- 3.1.2 Verduidelik jou antwoord op VRAAG 3.1.1. (2)
(4)
- 3.2 Menslike bloedgroepe word deur veelvuldige allele beheer.
- 3.2.1 Hoeveel allele beheer bloedgroepe? (1)
- 3.2.2 Watter TWEE allele is kodominant in die oorerwing van bloedgroepe? (2)
- 3.2.3 'n Man is heterosigoties vir bloedgroep A en trou met 'n vrou met bloedgroep O. Gebruik 'n genetiese kruising om die fenotipiese verhouding van hul nageslag te toon. (7)
(10)
- 3.3 Hemofilie is 'n genetiese afwyking wat deur 'n resessiewe alleel op die X-chromosoom veroorsaak word.
- 'n Vroulike hemofilielyer trou met 'n normale man. Verduidelik waarom al hulle seuns hemofilielyers sal wees. (4)



3.4 Vinke van die spesie *Geospiza fortis* word op een van die Galápagos-eilande gevind. Daar was variasie in hul snawelgrootte.

Al die vinke het altyd klein, sagte sade wat oorvloedig op die eiland voorgekom het, gevreet. Die eiland is toe deur 'n erge droogte geraak, wat voedsel skaars gemaak het.

Baie van die plante op die eiland het gevrek. Die klein, sagte sade was almal weg. Slegs harde, houtagtige sade het oorgebly.

Wetenskaplikes het 'n ondersoek gedoen om te bepaal wat die verhouding tussen snawelgrootte en oorlewing van die vinke voor en gedurende die droogte was.

Die tabel hieronder toon die resultate van 'n gedeelte van die ondersoek.

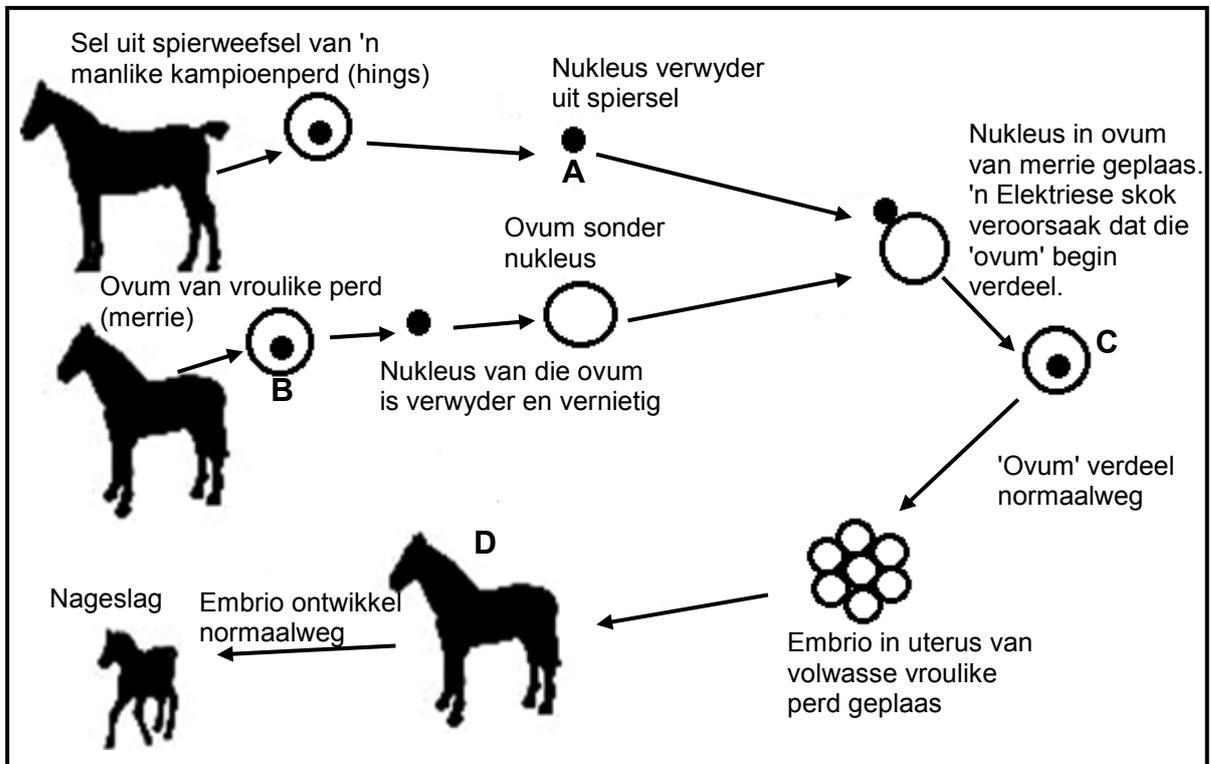
SNAWELGROOTTE (mm)	TOTALE GETAL VINKE VOOR DIE DROOGTE	TOTALE GETAL VINKE GEDURENDE DIE DROOGTE
7,3	2	0
7,8	12	2
8,3	30	4
8,8	48	4
9,3	45	6
9,8	40	8
10,3	25	10

[Aangepas uit *Excerpt Evolution*, Roberts et al.]

- 3.4.1 Noem VIER stappe wat die wetenskaplikes gevolg het om hul resultate te verkry. (4)
- 3.4.2 Noem die onafhanklike veranderlike in hierdie ondersoek. (1)
- 3.4.3 Beskryf die verhouding tussen die getal vinke gedurende die droogte en snawelgrootte. (2)
- 3.4.4 Gee 'n moontlike rede vir die verhouding in jou antwoord op VRAAG 3.4.3. (3)
- 3.4.5 Voorspel watter snawelgrootte(s) in die bevolking teenwoordig sou wees indien die droogte sou voortduur. (1)
- (11)**



3.5 Die diagram hieronder toon 'n proses van genetiese ingenieurswese/manipulasie. 'n Skenkersel is uit die spiersel van 'n manlike kampioenperd (hings) geneem om 'n nuwe nageslag te skep.



[Aangepas uit www.biologyreference.com]

- 3.5.1 Noem die:
- (a) Proses van genetiese ingenieurswese/manipulasie wat in die diagram hierbo getoon word (1)
 - (b) Proses wat ovum B voortbring het (1)
- 3.5.2 Waarom is die skenkersel van 'n kampioenperd geneem? (2)
- 3.5.3 Verduidelik waarom slegs die nukleus/selkern van die skenkersel gebruik word. (2)
- 3.5.4 'n Somatiese sel in 'n perd het 64 chromosome.
Hoeveel chromosome sal daar wees in:
- (a) Struktuur A (1)
 - (b) Ovum B (1)
 - (c) 'n Spiersel in organisme D (1)
- 3.5.5 Verduidelik waarom die 'ovum' gemerk C nie as 'n gameet beskou kan word nie. (2)

(11)
[40]

TOTAAL AFDELING B: 80



AFDELING C**VRAAG 4**

Die anoolakkedis van die Karibiese Eilande verteenwoordig 'n groep van ongeveer 150 nabyverwante spesies, wat in die laaste 50 miljoen jaar vanuit 'n enkele spesie ontstaan het.

Gebruik hierdie voorbeeld om te beskryf hoe natuurlike seleksie tot die proses van spesiasie van die 150 verskillende spesies akkedisse gelei het.

Inhoud: (17)
Sintese: (3)
(20)

LET WEL: GEEN punte sal vir antwoorde in die vorm van vloedigramme, tabelle of diagramme toegeken word NIE.

TOTAAL AFDELING C: 20
GROOTTOTAAL: 150





WESTERN CAPE

QUESTION 4

SECTION C

The anole lizard of the Caribbean Islands represents a group of about 150 closely related species, which evolved within the past 50 million years from a single species. Use this example to describe how natural selection led to the process of speciation that gave rise to the 150 different species of lizards.

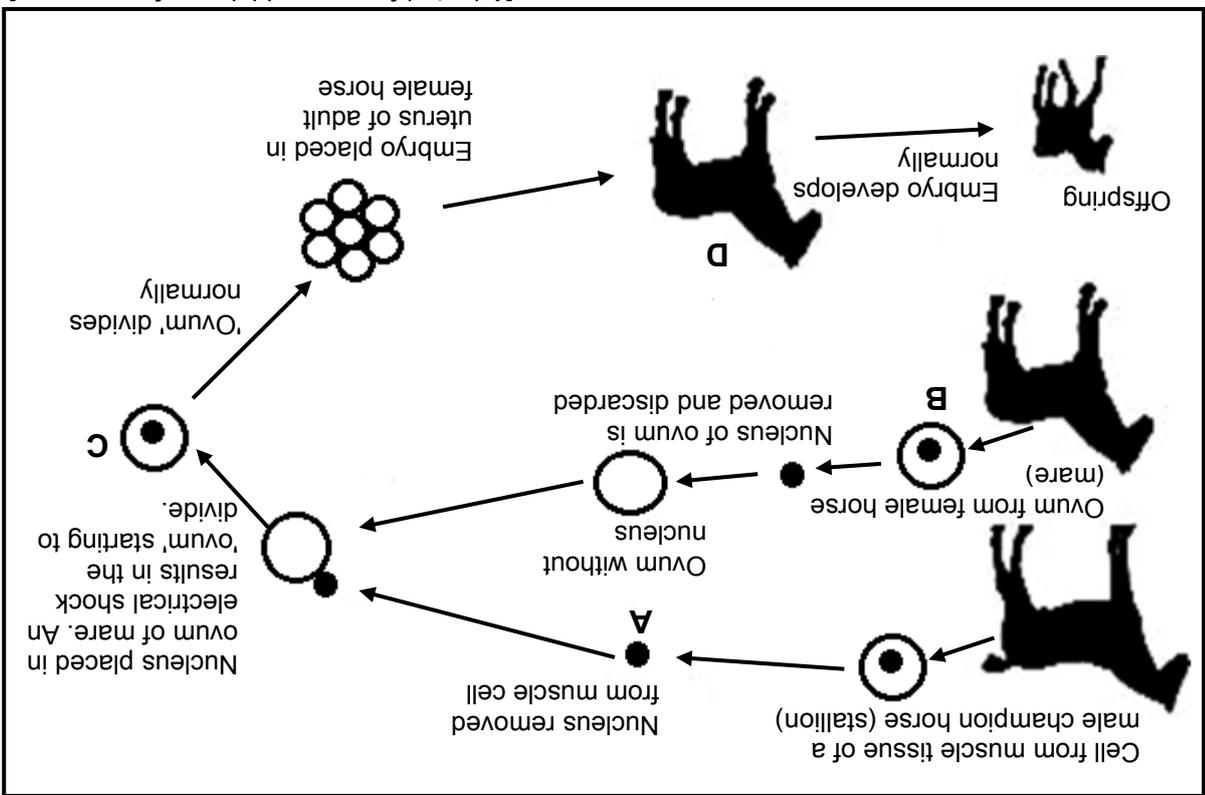
- Content: (17)
- Synthesis: (3)
- (20)

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

TOTAL SECTION C: 20
GRAND TOTAL: 150

3.5

The diagram below shows a genetic engineering process. A donor cell was taken from the muscle cell of a male champion horse (stallion) to create a new offspring.



[Adapted from www.biologyreference.com]

3.5.1 Name the:

- (1) (a) Genetic engineering process shown in the diagram above
- (1) (b) Process that produced ovum B
- (2) 3.5.2 Why is the donor cell extracted from a champion horse?
- (2) 3.5.3 Explain why only the nucleus of the donor cell is used.
- 3.5.4 A somatic cell in a horse contains 64 chromosomes. How many chromosomes would there be in:
 - (1) (a) Structure A
 - (1) (b) Ovum B
 - (1) (c) A muscle cell in organism D
- (2) 3.5.5 Explain why the 'ovum' labelled C cannot be considered a gamete.

[40]

TOTAL SECTION B:

80

Please turn over



WESTERN CAPE

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3.4

Finches of the species *Geospiza fortis* are found on one of the Galapagos Islands. There was variation in the size of their beaks.

All the finches used to feed on small, soft seeds which were plentiful on the island. Then the island was affected by a severe drought which made food scarce.

Many of the plants on the island died. The small, soft seeds were all gone. Only hard, woody seeds remained.

Scientists conducted an investigation to determine the relationship between beak size and survival of the finches before and during the drought.

The table below shows the results of part of the investigation.

BEAK SIZE (mm)	TOTAL NUMBER OF FINCHES BEFORE THE DROUGHT	TOTAL NUMBER OF FINCHES DURING THE DROUGHT
7,3	2	0
7,8	12	2
8,3	30	4
8,8	48	4
9,3	45	6
9,8	40	8
10,3	25	10

[Adapted from *Excerpt Evolution*, Roberts et al.]

- 3.4.1 List FOUR steps that the scientists followed to obtain their results. (4)
- 3.4.2 Name the independent variable of this investigation. (1)
- 3.4.3 Describe the relationship between the number of finches during the drought and beak size. (2)
- 3.4.4 Give a possible reason for the relationship in your answer to QUESTION 3.4.3. (3)
- 3.4.5 Predict which beak size(s) would be present in the population if the drought continued. (1)

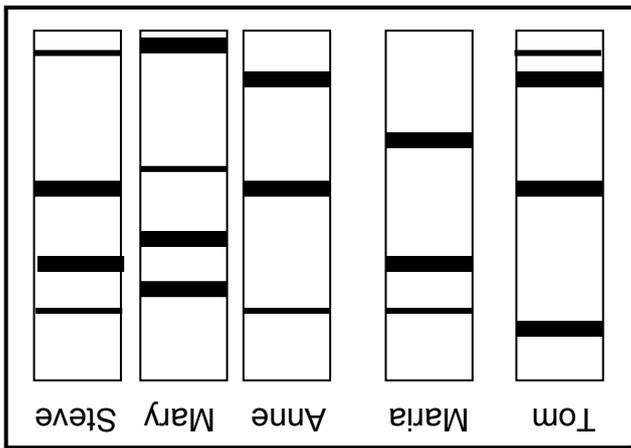
(11)



QUESTION 3

3.1 Tom and Maria have three children. One of the three children was adopted. A DNA profile for each member of the family was prepared to determine if Tom is the father of all three children (Anne, Mary and Steve).

The DNA profiles are given below.



3.1.1 Which ONE of the children has been adopted? (2)

3.1.2 Explain your answer to QUESTION 3.1.1. (4)

3.2 Human blood groups are controlled by multiple alleles. (1)

3.2.1 How many alleles control blood groups? (1)

3.2.2 Which TWO alleles are codominant in the inheritance of blood groups? (2)

3.2.3 A man is heterozygous for blood group A and marries a woman who has blood group O. Use a genetic cross to show the phenotypic ratio of their offspring. (7)

3.3 Haemophilia is a genetic disorder caused by a recessive allele on the X chromosome. (4)

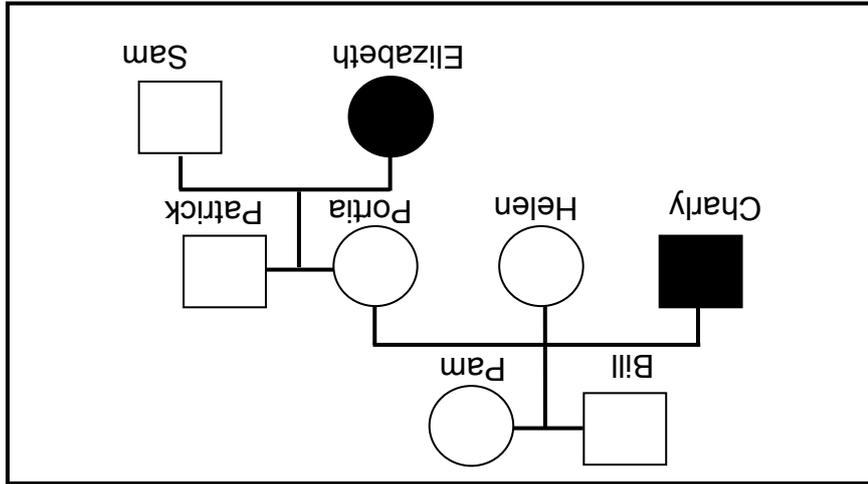
A haemophilic female marries a normal male. Explain why all their sons will be haemophiliacs. (4)



2.5

Tay-Sachs disease is caused by an autosomal recessive allele (n). Children with Tay-Sachs disease lose motor skills and mental functions. Over time, the children become blind, deaf, mentally retarded and paralysed. Tay-Sachs children die by the age of five.

The pedigree diagram below shows the inheritance of Tay-Sachs disease in a family.



2.5.1 Give:

(a) Charly's phenotype

(2)

(b) Portia's genotype

(2)

(c) Bill's genotype

(2)

2.5.2 Explain why Patrick is normal, but a carrier of Tay-Sachs disease.

(2)

(8)

[40]



2.3

The diagram below represents nitrogen-base sequences of a part of a nucleic acid that codes for making insulin. Insulin is necessary for the uptake of sugar from the blood.

The sequences below are from two individuals and are read from left to right. Sequence 1 is from a normal person and sequence 2 is from a person who shows a mutation and cannot produce insulin.

TWO NITROGEN-BASE SEQUENCES OF A PART OF A NUCLEIC ACID									
Sequence 1	TAG	CCA	CAC	GTT	ACA	ACG	TGA	AGG	TAA
Sequence 2	TAT	CCA	CAC	GTT	ACA	ACG	TGA	AGG	TAA

2.3.1 Which nucleic acid is represented in both sequences? (1)

2.3.2 Where did the mutation in the second sequence occur? (1)

The table below shows the amino acids coded for by different DNA base triplets.

AMINO ACID	DNA BASE TRIPLET
Glycine	CCG
	CCT
	CCC
Valine	CAT
	CAC
	GTA
Histidine	GTG
	GGA
	GGC
Isoleucine	TAA
	TAT

2.3.3 Give the:

(a) Anticodon of the fourth base triplet on sequence 2 (2)

(b) Amino acid coded for by the first base triplet in sequence 2 (2)

2.4 Describe the process of transcription in protein synthesis. (4)



2.2

Study the table below that shows the change in antibiotic resistance in three strains of bacteria (MRSA, VRE and FQRP) over a period of 20 years.

YEAR	MRSA	VRE	FQRP
	ANTIBIOTIC RESISTANCE (%)		
1981	2	0	0
1985	10	0	0
1989	15	2	0
1993	40	5	5
1997	40	20	10
2001	60	20	25

[Source: <http://wallace.genetics.uga.edu/groups/evoll>]

2.2.1

Which bacterial strain was the:

(a) Most resistant to antibiotics over the years (1)

(b) Last to develop antibiotic resistance (1)

2.2.2 Calculate the percentage increase in antibiotic resistance in VRE from 1993 to 1997. (3)

2.2.3 Draw a line graph to show the development of antibiotic resistance in the bacterial strain MRSA. (6)

(11)



SECTION B
QUESTION 2

2.1 Read the passage below.

NEW HOMININ SPECIES DISCOVERED

On 13 September 2013 scientists discovered fossils in the Sterkfontein Caves of South Africa which appeared to belong to a previously unknown species of hominins.

The fossils were classified as a new species, *Homo naledi*. The physical characteristics of *H. naledi* are described as having traits similar to the genus *Australopithecus*, mixed with traits more characteristic of the genus *Homo*. It appeared that *H. naledi* represented a transitional fossil.

An analysis of *H. naledi*'s skeleton suggests that it stood upright and was bipedal. The structure of the pelvis is similar to the *Australopithecines*, but its legs, feet and ankles are more similar to the genus *Homo*.

Four skulls were discovered, each with approximately half the volume of modern human skulls. The *H. naledi* skulls are closer in cranial volume to the skull of *Australopithecus*, but the cranium structure is more similar to those found in the genus *Homo*.

The teeth are much smaller than those of *Australopithecus* and similar to the teeth of modern humans.

[Adapted from <https://humanorigins.si.edu/evidence>]

- 2.1.1 Define the term *transitional fossil*. (2)
 - 2.1.2 Name a characteristic from the passage that *Homo naledi* shared with both *Australopithecus* and *Homo*. (1)
 - 2.1.3 State ONE other characteristic from the passage that *Homo naledi* shared only with *Australopithecus*. (1)
 - 2.1.4 Explain TWO characteristics of a skeleton which are adaptations for bipedalism. (4)
 - 2.1.5 Give ONE possible reason why there was a change to smaller teeth in modern humans. (3)
- (11)



1.6

Coat colour in mice is controlled by two alleles, black (**B**) and grey (**b**). Tail length is controlled by two alleles, long (**T**) and short (**t**).

The Punnett square below shows a part of the cross between two mice. Genotype (**i**) has been left out.

					Parent 2				
Parent 1					Bt	Bt	Bt	Bt	Bt
					Bt	Bt	Bt	Bt	Bt
					Gametes	BT	Bt	Bt	Bt

1.6.1 Give the:

(2) (a) Genotype of parent 1

(2) (b) Phenotype of parent 2

(1) (c) Genotype of offspring (**i**)

1.6.2 What percentage of the offspring above is grey with short tails? (1)

1.6.3 State the genotypes of T_WO gametes from the table above that will result in offspring that are heterozygous for both traits, if fertilisation occurs. (2)

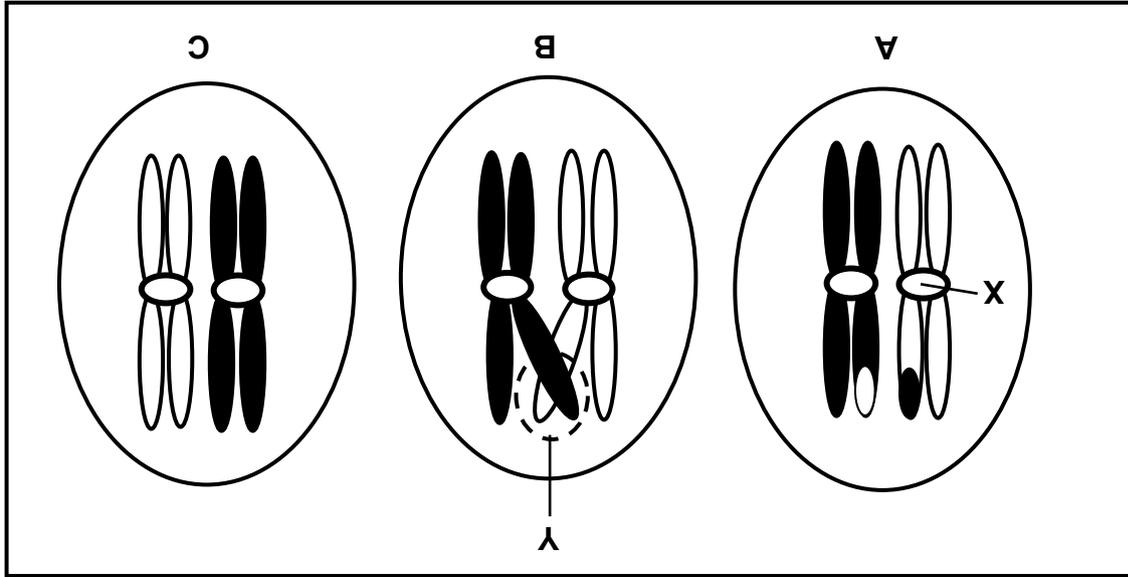
(8)

50 TOTAL SECTION A:



1.5

The diagrams below represent a chromosome pair in a female human cell. The cells (**A**, **B** and **C**) show different events in a phase of meiosis, which are not necessarily in the correct sequence.

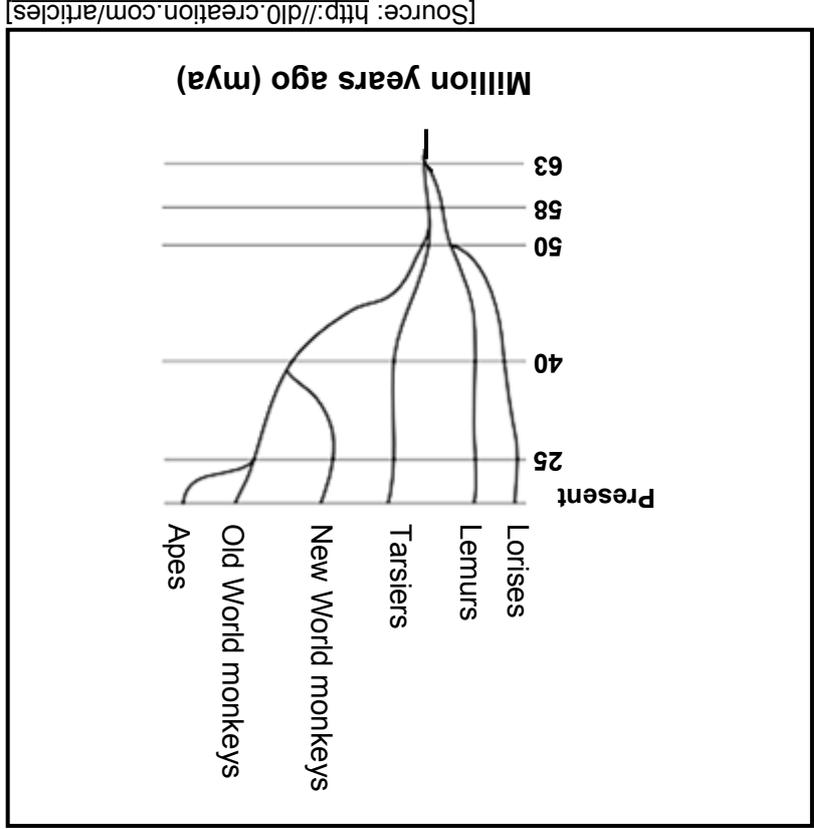


- 1.5.1 How many pairs of chromosomes occur in a normal human cell? (1)
- 1.5.2 Give labels for: (1)
- (a) Structure **X** (1)
- (b) Area **Y** (1)
- 1.5.3 Name the organ in the human female where meiosis occurs. (1)
- 1.5.4 Name the: (1)
- (a) Process occurring in diagram **B** (1)
- (b) Phase represented by the diagrams above (1)
- (c) Type of cells that would result from meiosis of this cell (1)
- 1.5.5 Arrange the letters **A**, **B** and **C** to show the correct sequence of the events. (1)

(8)



1.4 The diagram below shows possible evolutionary relationships among primates.



1.4.1 How many million years ago did the:

- (1) (a) Apes appear on Earth
- (1) (b) Common ancestor evolve to form the Tarsiers and Lemurs
- (2) Which TWO species share the most recent common ancestor?
- (1) Which species is most closely related to the Lemur?

(5)



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 1.2.7) in the ANSWER BOOK.

1.2.1 A sudden change in the sequence/order of nitrogenous bases of a nucleic acid

1.2.2 Explanation of an observation that is supported by facts, models and laws

1.2.3 The breeding of organisms over many generations in order to achieve a desirable phenotype

1.2.4 The type of sugar found in an RNA molecule

1.2.5 Type of evolution involving long periods of time when species do not change and short periods of rapid change

1.2.6 The hypothesis which supports migration of human ancestors from the point of origin

1.2.7 The mineralised remains of organisms that have lived in the past

(7) (7 x 1)

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 1.3.3) in the ANSWER BOOK.

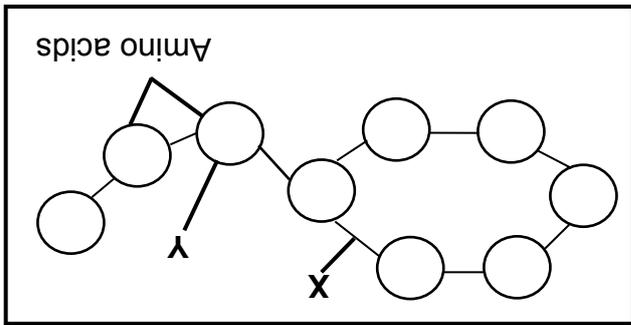
COLUMN I		COLUMN II	
1.3.1	Occurs during telophase of meiosis I	A: Dividing of the cytoplasm	B: Centrioles move to the opposite poles
1.3.2	Location of DNA	A: Nucleus	B: Mitochondria
1.3.3	Found in African apes and humans	A: Claws instead of nails	B: An opposable thumb

(6) (3 x 2)



1.1.5

The diagram below represents the chemical structure of a protein.



X represents a ...

- A hydrogen bond.
- B nitrogen base.
- C peptide bond.
- D mRNA molecule.

1.1.6

The difference between nucleic acids and nucleotides is that ...

- A nucleic acids are building blocks of nucleotides.
- B nucleotides are building blocks of nucleic acids.
- C nucleotides are larger than nucleic acids.
- D nucleic acids are found in the nucleus and nucleotides are found in the cytoplasm.

1.1.7

Which ONE of the following events occurs during metaphase I of meiosis?

- A Homologous chromosomes arrange themselves at the equator
- B Centrioles move to opposite poles
- C Chromosomes arrange themselves singly at the equator
- D Splitting of the cytoplasm

1.1.8

Comparisons of the amino acid sequences in a protein have been made between humans and a number of other organisms. The number of differences is shown in the table below.

ORGANISM	SHARK	KANGAROO	FISH	COW	LIZARD
Number of differences in amino acid sequences in a protein compared to humans	79	27	68	17	62

The type of evidence for evolution in the table above is ...

- A fossil evidence.
- B biogeography.
- C cultural evidence.
- D genetic evidence.

[Adapted from AQA Biology 1998]

(16) (8 x 2)



SECTION A
QUESTION 1

1.1 Various options are provided as possible answers to the following questions. Write down the question number (1.1.1–1.1.8), choose the answer and make a cross (X) over the letter (A–D) of your choice in the ANSWER BOOK.

EXAMPLE:

1.1.9	A	B	C	B
-------	---	---	---	--------------

1.1.1 The process where one DNA molecule produces two identical DNA molecules is called ...

A reproduction.

B replication.

C translation.

D protein synthesis.

1.1.2

A difference between DNA and RNA:

A RNA is double-stranded and DNA is single-stranded.

B DNA has a sugar-phosphate frame, whereas RNA does not.

C There are weak hydrogen bonds in DNA, but not in RNA.

D RNA has a helix structure and DNA is straight.

1.1.3

A pedigree diagram shows ...

A how organisms evolve.

B the inheritance of characteristics over many generations.

C sex-linked characteristics only.

D the number of children in a family only.

1.1.4

A red flowering plant is crossed with a white flowering plant. All the offspring have pink flowers. When the two pink flowering plants are crossed, the next generation of flowering plants will have flowers that are ...

A pink only.

B red only.

C white only.

D pink, red and white.





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, tables 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, 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 2017

LIFE SCIENCES P2

LFSC.2

GRADE 12

NATIONAL
SENIOR CERTIFICATE

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

basic education

