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IBANGA 12

SEPTEMBER 2021

LIFE SCIENCES P2

MARKS: 150

TIME: 2½ iiyure



Eli phepha loviwo linamaphepha ali 18.

IMIYALELO NOLWAZI

Funda le miyalelo ilandelayo ngenyameko ngaphambi kokuba uphendule imibuzo.

1. Phendula YONKE imibuzo.
2. Bhala ZONKE iimpindulo kwi NCWADI YEEMPENDULO okanye KWIPHEPHA onikwe lona.
3. Qala impindulo yombuzo NGAMNYE kwiphepha ELITSHA.
4. Nombola iimpindulo ngokuchanekileyo ngokwendlela yokunombola esetyenzisiweyo kwiphepha lemibuzo.
5. Nika iimpindulo zakho ngokwemiyalelo yombuzo ngamnye.
6. YONKE imizobo MAYENZIWE ngepensile ibhalwe i-inki eblowu okanye emnyama.
7. Zoba iidayagram, iitheybhile okanye iitshati KUPHELA xa uceliwe ukuba wenze njalo.
8. Imizobo ekweli phepha lemibuzo AYIZOTYWANGA ncakasana ngokwesikali.
9. MUSA ukusebenzisa iphepha legrafu.
10. Kuya kufuneka usebenzise ikhalithyuleyitha engacwangciswa, iprotractor kunye nekhamyasi, apho kukho imfuneko.
11. Lonke ubalo luya kusondezwa luza kufikelela kwizithuba ezibini zedesimali.
12. Bhala ngokucocekileyo nangokucacileyo.

ICANDELO A

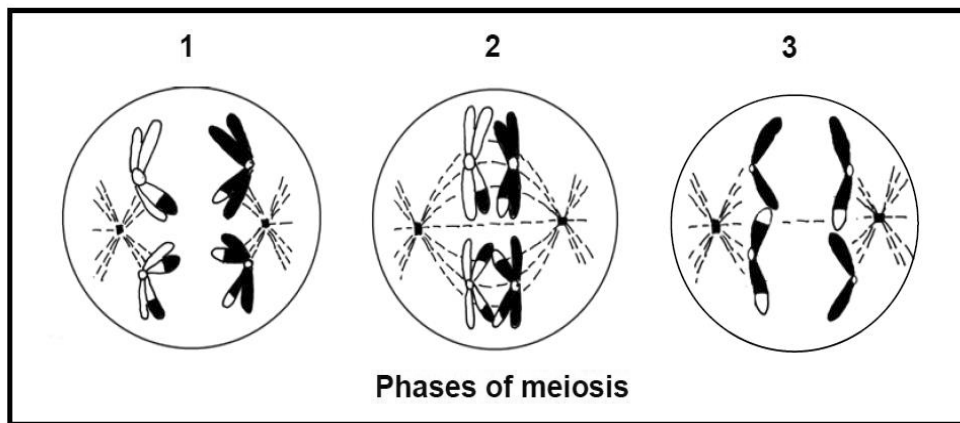
UMBUZO 1

1.1 Unikwe iimpendulo ezahlukeneyo zokuphendula le mibuzo ilandelayo. Khetha impendulo echanekileyo ubhale kuphela unobumba (A–D) ecaleni kwenombolo yombuzo (1.1.1–1.1.10) kwiINCWADI YEEMPENDULO, umzekelo 1.1.11 D.

1.1.1 YEYIPHI inkcazo enxulumene nobume bendalo yemolekyuli yeDNA?

- A ine sugar phosphate frame
- B idouble stranded
- C inehelix structure
- D inecomplementary nucleotides

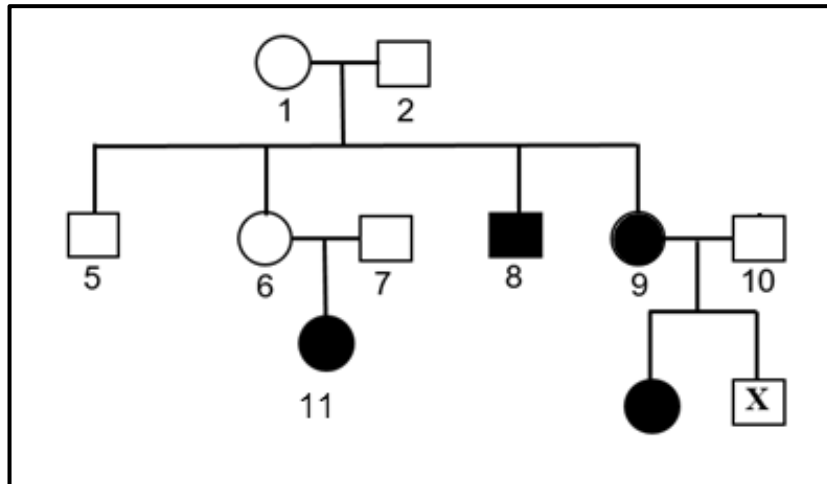
1.1.2 Lo mzobo ungezantsi ubonisa iiphases ezahlukeneyo ze meiosi.



Indlela echanekileyo yokulandelelana kwezigaba ...

- A 1, 2, 3
- B 3, 2, 1
- C 1, 3, 2
- D 2, 1, 3

- 1.1.3 Ipedigree diagram engezantsi ibonisa ufuzo lwe cystic elawulwa yi recessive allele, kusapho oluthile.



YEYIPHI kwezi zilandelayo ebonakalisa iphenotype ka individual **X**?

- A Indoda engachaphazelekanga (unaffected)
 - B Indoda echaphazelekileyo (affected)
 - C Umfazi ngachaphazelekanga (unaffected)
 - D Umfazi ochaphazelekileyo (affected)
- 1.1.4 Kwiziqithi zaseGalapagos kukho iintlobo eziyi13 zeefinches kwiintlobo ezahlukeneyo zeziqithi. Iiscientist zikholelwa ekubeni zonke zazivela kwi ancesta enye eyavela kwi mainland.

Yeyiphi ENYE kwezi zinto zilandelayo ebangele inyathelo lokuqala le evolution kweentlobo zii 13 zee finches ezisuka kwi ancesta enye?

- A Ukuzala ngamaxesha ohlukeneyo onyaka
 - B I Geographical separation lulwandle
 - C Producing infertile offspring
 - D I natural selection
- 1.1.5 Unwele olu curly lu dominant kunwele olu straight. Umfazi o homozygous kunwele olu curly utshata indoda e homozygous kunwele olu straight.

Ithini I possibility yabo ukuze bazale umntwana onwele zistraight.

- A 25%
- B 50%
- C 100%
- D 0%

- 1.1.6 Indoda enegazi elingu A kunye nowasetyhini onegazi elingu O banomntwana kunye. Yeyiphi ENYE kwezi blood group genotypes zilandelayo enokuthi ibe yeyomntwana wabo?
- A ii
 B $I^A I^B$
 C $I^A I^A$
 D $I^B i$
- 1.1.7 Yeyiphi ENYE kwezi zilandelayo eyenzeka ngexesha le division yokuqala kwi-meiosis?
- A iiChromatids ziyohlukana ukuya kwiipoles ezohlukeneyo sep
 B lidentical haploid cells ziyenzeka
 C INondisjunction
 D lialleles ze gene ziyadibana
- 1.1.8 Yeyiphi ENYE kwezi zilandelayo eyinyani malunga nemitochondrial DNA (mtDNA)?
- A Iyadluliselwa isuka kutata iye emntwaneni
 B Ingasetyenziswa ukubonakalisa I female ancestry
 C Ingasetyenziswa ukubonakalisa iancestors ezingamadoda ezizale abafazi
 D Ibonakalisa ukuba I ancesta endala eyindoda yafunyanwa eAfrika
- 1.1.9 I-Haemophilia sisifo esi sex linked ebantwini. Utata nonyana wakhe bobabini bane-haemophilia, kodwa umama akanayo. Uhlobo lwe genotype lukamama luya kuba ...
- A $X^h X^h$.
 B $X^H X^h$.
 C $X^H X^H$.
 D $X^h Y$.
- 1.1.10 Iyakuba yeyiphi ipesenti yeguanine kwi DNA molecule, ukuba i 20% yenitrogenous bases yi adenine?
- A 20%
 B 30%
 C 40%
 D 60%

(10 x 2) (20)

1.2 Nika **ibiological term** echanekileyo yenkcazelo NGANYE kwezi zilandelayo. Bhala eli gama kuphela ecaleni kwenombolo yombuzo (1.2.1 ukuya ku-1.2.8) kwiiNCWADI YEEMPENDULO.

1.2.1 Iphysical okanye ifunctional expression ye gene

1.2.2 Ii non-sex chromosomes

1.2.3 Indawo apho iichromatids zidibana khona ngexesha le crossing over

1.2.4 Icandelo lemolekyuli yeDNA ekhangela uphawu oluthile

1.2.5 Iprocess apho i-mRNA iveliswa kwi-nucleus ngexesha le protein synthesis

1.2.6 Ukuveliswa kwekopi yemfuza efanayo ye organism usebenzisa ibiotechnology

1.2.7 Iichromosome ezine set enye yeegene

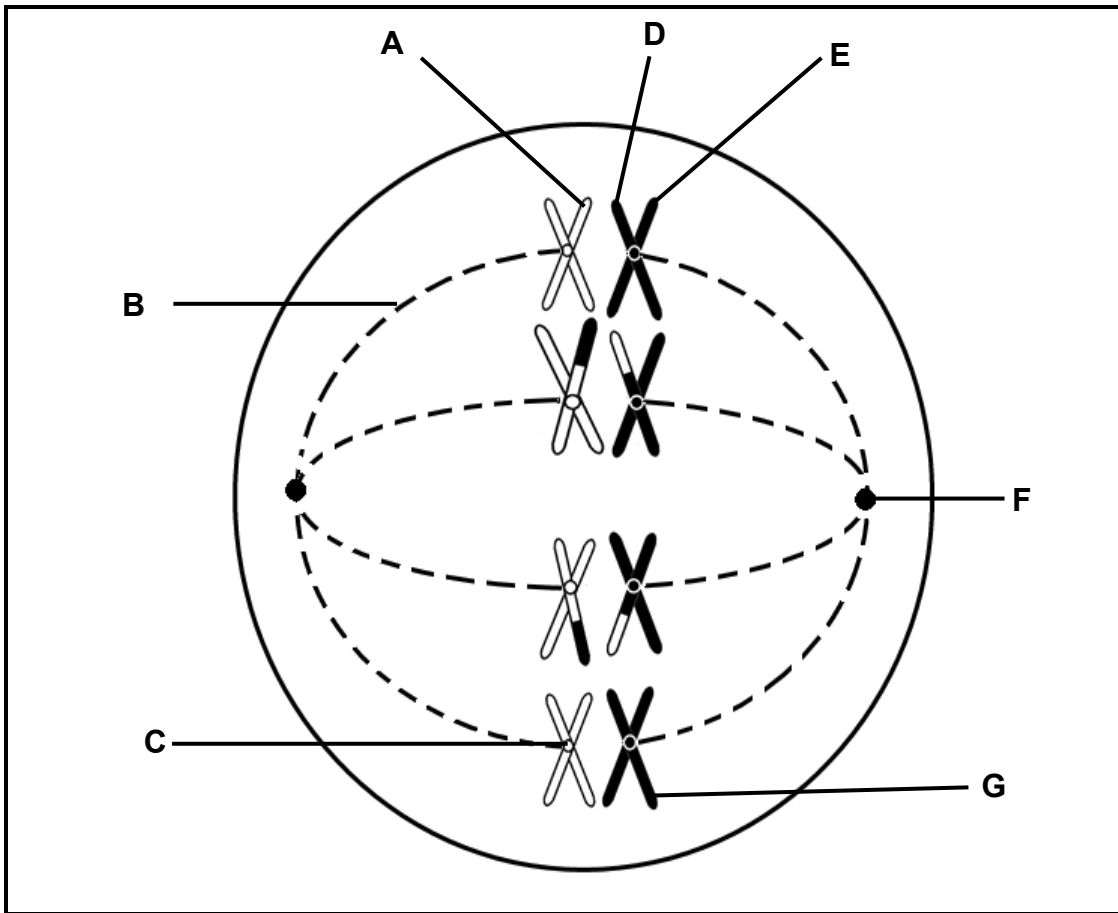
1.2.8 Isikhundla apho uhlobo oluthile lwe gene lufunyanwa kwichromosome
(8 x 1) (8)

1.3 Chaza ukuba ngaba ingxelo nganye kwiKHOLAM I isebenza ku **A KUPHELA, B KUPHELA, ZOMBINI A no B**, okanye **AKUKHO NANYE** yezinto kuKHOLAM II. Bhala u **A kuphela, B kuphela, zombini u A no B**, okanye **akukho nanye** ecaleni kwamanani emibuzo (1.3.1–1.3.3) KWINCWADI YEEMPENDULO

KHOLAM I		KHOLAM II	
1.3.1	Uhlobo lwemfuzaapho kungekho nanye kwi allele ezimbini edominant kunenye kwaye an immediate phenotype is produced	A:	Co-dominance
		B:	Incomplete dominance
1.3.2	Umzekelo we reproductive isolation mechanisms	A:	yiSpecies-specific courtship behaviour
		B:	yiPrevention of fertilisation
1.3.3	Inani lee allele ezilawula ihuman blood group	A:	Two
		B:	Three

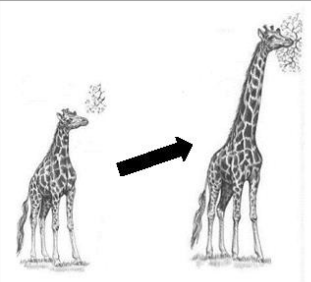
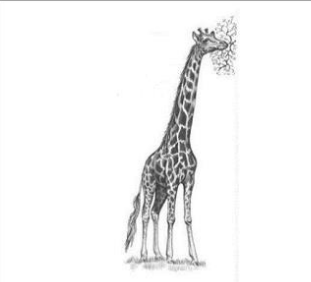

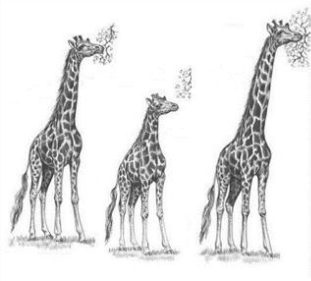
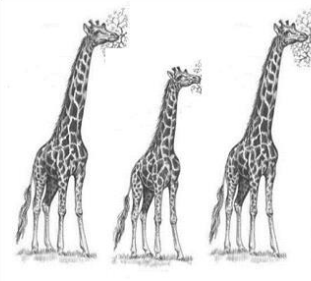
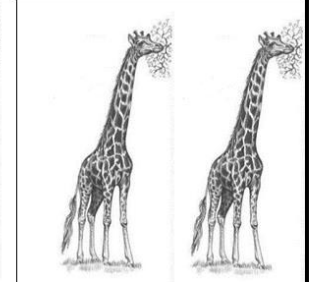
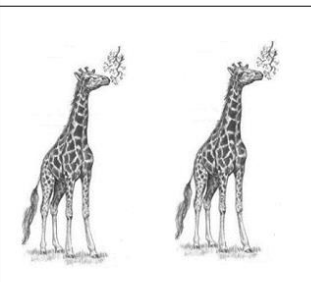
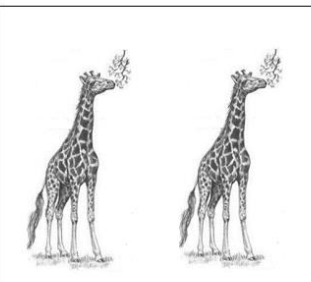
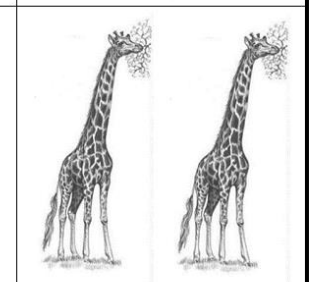
(3 x 2) (6)

1.4 Umzobo ongezantsi umele iseli ngexesha lokwahlulwa kweseli.



- 1.4.1 Xela uhlobo lokwahlulwa kweseli oluboniswe kumzobo ongasantla. (1)
- 1.4.2 Xela isigaba sesahlulo seseli esimelwe ngulo mzobo. (1)
- 1.4.3 Nika u/oonobumba o/abamele:
 - (a) Istructure esihambisa iichromosomes / chromatids ukuya kwiipoles ngexesha lokwahlulwa kweseli (1)
 - (b) Indawo enomsebenzi wokwenza ispindle fibres (1)
 - (c) iichromatids EZIMBINI ezifanayo (2)
- 1.4.4 Zingaphi iichromosomes eziya kufunyanwa kwiseli nganye ekupheleni kolu lwahlulo lweseli. (1)
- 1.4.5 Nika igama leeseli eziza kuba ziziphumo zolu hlobo lokwahlulwa kweseli kwindoda. (1)

1.5 Imizobo engezantsi imele izimvo ezintathu ezicetywayo malunga nendlela yendaleko.

IDEA	10 MYA	5 MYA	PRESENT
A			
B			
C			

1.5.1 Umele ntoni u MYA? (1)

1.5.2 Nika UNOBUMBA wedayagram (A, B okanye C) omele:

- (a) i punctuated equilibrium (1)
- (b) Ingcaciso ka Lamarck nge evolution, ukuba kwakukho ienvironmental change 10mya (1)
- (c) Ingcaciso ka Charles Darwin ye evolution (1)

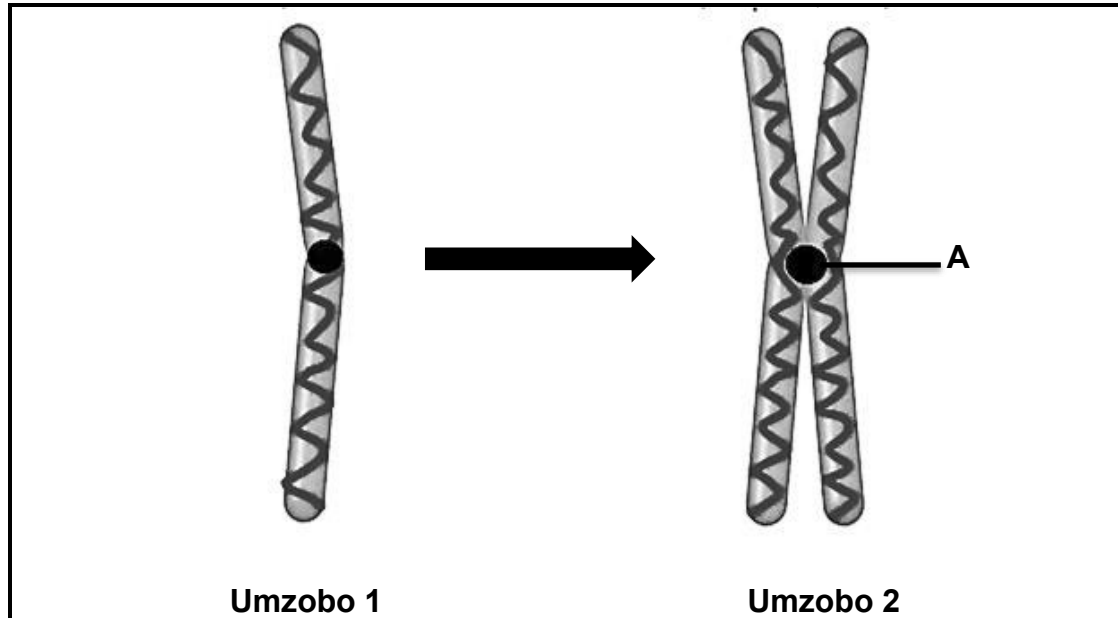
1.5.3 Nika isizathu sokuba kutheni i Theory ye Evolution ithathwa njenge scientific theory. (1)

1.5.4 Xela izinto zibe NTATHU ezibubungqina obuxhasa iththeory of evolution. (3)

AMANQAKU ECANDELO A: 50

ICANDELO B**UMBUZO 2**

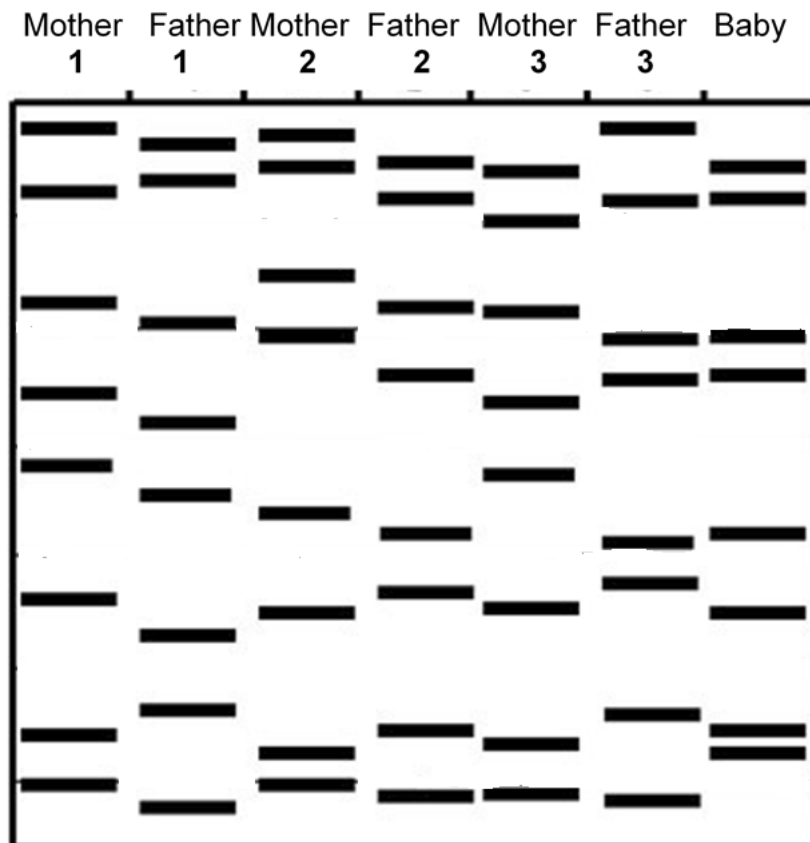
2.1 Imizobo engezantsi ibonisa iintlobo ezimbini zechromosome.



- 2.1.1 Nika ilebheli ka **A**. (1)
- 2.1.2 Xela inkqubo ekhokelele ekwakhiweni kwechromosome emelwe ngumzobo 2. (1)
- 2.1.3 Chaza inkqubo ekhankanywe kuMBUZO 2.1.2. (4)
- 2.1.4 Nika izizathu zibe MBINI zokuba kutheni le nkqubo ichazwe kuMBUZO 2.1.3 ibalulekile. (2)

2.2 Itsunami itshabalalisa idolophu eselunxwemeni eJapan. Emva koko usana luyahlangulwa. Iseti ezintathu zabazali zibanga ukuba baphulukene nosana kwiitsunami. Uvavanyo lweDNA lwenziwa kwiiseti ezintathu zabazali kunye nosana.

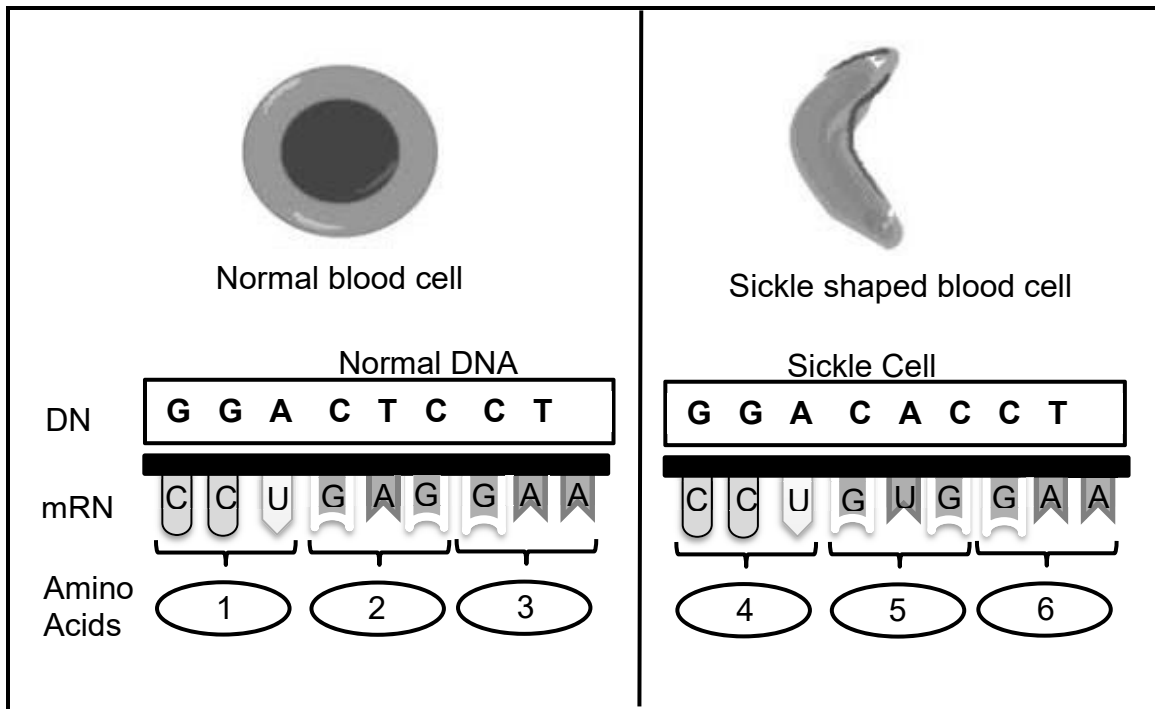
Apha ngezantsi kukho iziphumo zovavanyo lweDNA:



- 2.2.1 Yeyiphi iseti yabazali (iseti 1, 2 okanye 3) engabazali bemvelo bomntwana? (1)
- 2.2.2 Nika isizathu sempendulo yakho kuMBUZO 2.2.1. (2)
- 2.2.3 Xela iisources eziMBINI zeDNA amapolisa anokuzisebenzisa ukwenza iprofayili yeDNA. (2)
- 2.2.4 Nika eminye imisebenzi EMIBINI apho inokusetyenziswa khona iDNA profayilingi ngaphandle kwale ikhankanywe apha ngasentla. (2)

2.3 Iprotein ekwiiseli ezibomvu zegazi ehambisa ioksijini egazini ibizwa ngokuba yihaemoglobin-**A**. Xa utshintsho lwenzeka kwiigene zehemoglobin-**A**, ithymine ithathelwa indawo yiadenine. Endaweni yokuvelisa ihemoglobin-**A** eqhelekileyo igene eguqulweyo ngoku ivelisa ihemoglobin-**S**. Oku kubangela ukuba iiseli ezibomvu zegazi ziqine kwaye zimilise okwe rhengqa, zikhokelela kwisifo esiyi sickle cell. Iiseli ezibomvu ezimile okwe rhengqa zibangela ukuvaleka kwemithambo yegazi. Okwangoku unyango lwesifo sesickle cell kukufakelwa komongo wethambo kuphela kunye nonyango lwestem cell.

Umzobo ongezantsi ubonisa ubume beeseli zegazi kunye nokulandelelana kweDNA yehemoglobi-**A** (iseli yegazi eqhelekileyo) kunye nehemoglobin-**S** (iseli yegazi emile okwe rhengqa).



2.3.1 Kutheni siyingozi isifo I sickle cell? (1)

2.3.2 Zintoni iistem cells? (2)

2.3.3 Sebenzisa le theyibhile ingezantsi ukuphendula le mibuzo ilandelayo.

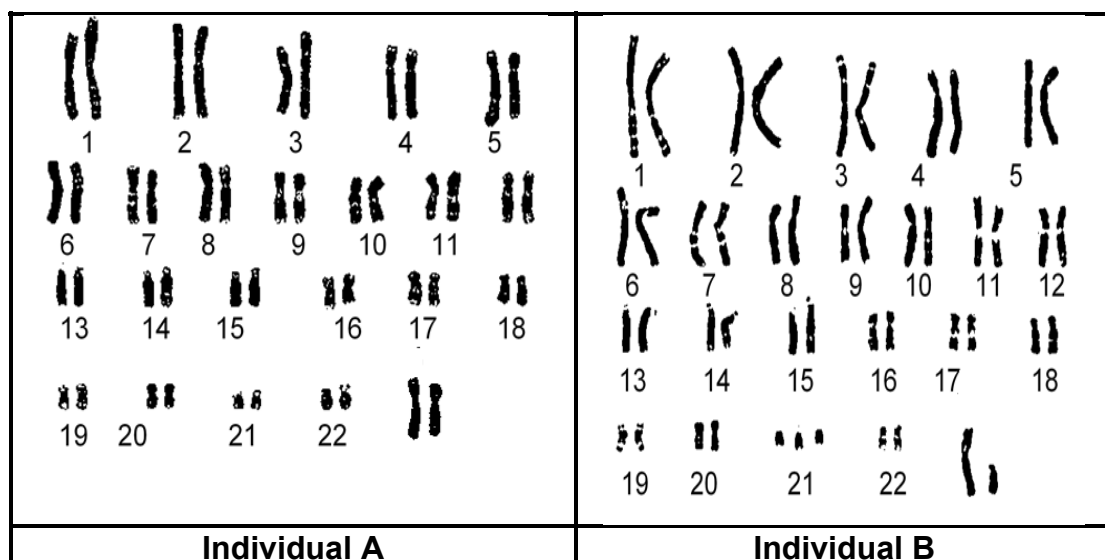
Amino Acid	tRNA anticodon
Leucine	GAA
Lycine	CUU
Glycine	GGA
Glutamic acid	GAG
Histidine	GUA
Methionine	UAC
Proline	CCU
Valine	CAC
Glutamine	CUC

- (a) Nika i anticodon ye amino acid **6**. (1)
- (b) Nika igama le amino acid **1**. (1)
- (c) Chaza ukuba olu tshintsho lukuchaphazela njani ukulandelelana kwee amino acid. (4)

2.3.4 I allele ye haemoglobin-**A** i dominant (**H**) kuleyo yehaemoglobin-**S** (**h**). Indoda ehomozygous for haemoglobin-**A** inomntwana nomfazi o heterozygous .

Sebenzisa I genetic cross ukubonisa ukuba kunokwenzeka ukuba babe nomntwana onehaemoglobin-**S**. (6)

2.4 Imizobo engezantsi ibonisa iichromosomes kwiiseli zabantu ababini.



2.4.1 Chaza uhlobo lomzobo oboniswe ngentla. (1)

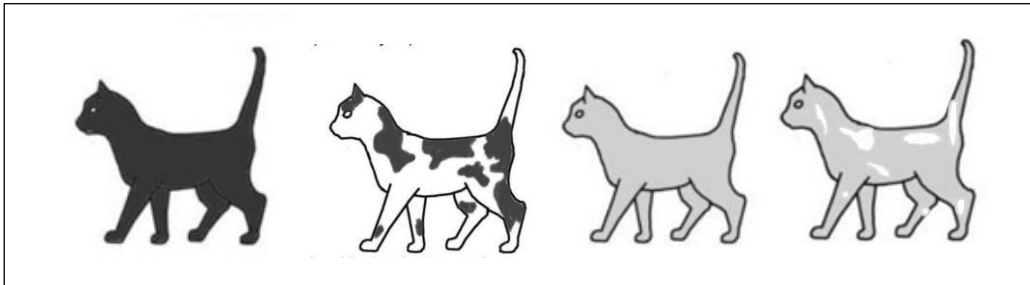
2.4.2 Kutheni kunokuthwa udayagram **A** ngowomntu wasetyhini. (2)

- 2.4.3 Chaza ukuba kutheni le mizobo ingasentla ibonisa iichromosomes zeseli yesomatic hayi igamete. (2)
- 2.4.4 Chaza ingxaki anayo umntu ongu **B**. (1)
- 2.4.5 Chaza unobangela wokuphazamiseka okuchazwe kuMBUZO 2.4.4. (3)

2.5 Kwiikati, iigene ezimbini kwii-autosomes ezahlukeneyo zinezi alleles zilandelayo.

B: umbala umnyama	T: akukho mabala amhlophe
b: umbala ungwevu	t: amabala amhlophe

likati ezimbini zatshatiswa. Zazala amantshontsho ayi 16 anezi phenotypes zilandelayo ziboniswe ngezantsi **9: 3: 3: 1**.



Phenotype A	Phenotype B	Phenotype C	Phenotype D
Imnyama	imnyama namhlophe	igwevu	ingwevu namhlophe

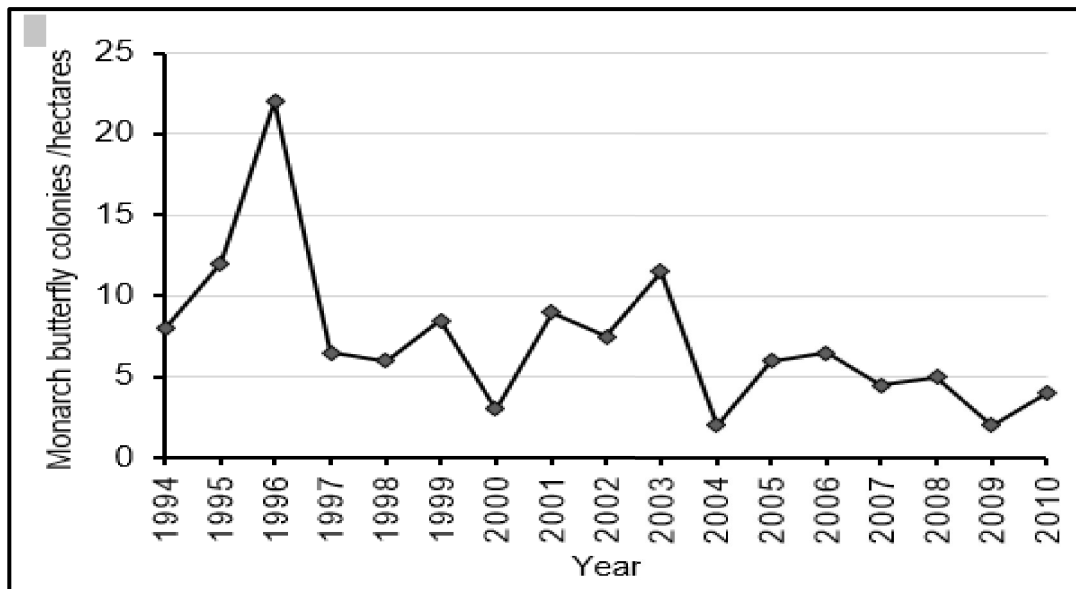
- 2.5.1 Xela iintlobo zeecross ezibonakaliswe apha. (1)
- 2.5.2 Nika isizathu sokuphendula kwakho UMBUZO 2.5.1. (1)
- 2.5.3 Nika i: (2)
- (a) Genotype ka phenotype **D** (2)
- (b) Phenotypes zabazali
- 2.5.4 Chaza ukuba kutheni zonke iikati ezi mnyama namabala amhlophe kuboya bazo zingenayo I genotype efanayo. (2)
- 2.5.5 Chaza iprinciple ka Mendel yokwahlukanisa. (3)

[50]

UMBUZO 3

3.1 Izityalo zombona zigenetically modified (GM) ukuze zinganyangeki kwiyeza. Oku kuthetha ukuba xa umfama efafaza izilimo zakhe ngesitshalalisi sokhula, umbona awusayi kuchaphazeleka. Isityalo se-*milkweed* lukhula olukhula phakathi kwezityalo zombona. I monarch butterfly ibeka amaqanda ayo kumaqela (iikhholoni) kuphela kwisityalo se-*milkweed*. Xa amaqanda eqanduselwa, amantshontsho atya amagqabi esityalo esisikiweyo.

Iscientists ziye zaqaphela ukuba ngokwanda kokusetyenziswa kwalo iyeza lokubulala ukhula, inani lamabhabhathane e *monarch* liye lancipha. Balima iherbicide resistant maize crops ukusukela ngo 1994 ukuya ku 2010. Ukusuka ngo 1998 baqalisa ukufafaza ichiza lokubulala ukhula. Qho ngonyaka babala inani lecolonies ze monarch butterfly. Igrafu engezantsi ibonisa idatha ababeyiqokelele ukusuka ngo 1994 ukuya ku 2010.



- 3.1.1 Nika isihloko segrafu elapha ngasentla. (1)
- 3.1.2 Nika i:
- (a) Independent variable (1)
- (b) Dependent variable (1)
- 3.1.3 Ukusuka kwigrafu bonisa ubungqina bokuba kutheni iyeza lokubulala ukhula, ililo unobangela wokwehla kwamanani ecolonies ze monarch butterfly. (2)
- 3.1.4 Yintoni i Genetically Modified organism? (2)
- 3.1.5 Nika inzuzo ibe NYE kwezoqoqosho enokwenziwa ngumbona we-GM kumfama. (2)

3.2 Funda isicatshulwa esingezantsi.

EBrazil kunokufumaneka iintlobo ezininzi zamacikilishe atya iintubi.

Iintubi zizinambuzane ezincinci ezinjengeembovane.
Ziyohluka ngobukhulu.



Amacikilishe amakhulu aneentloko ezinkulu angatya iindid
Iintubi zibandakanya iintubi ezinkulu.

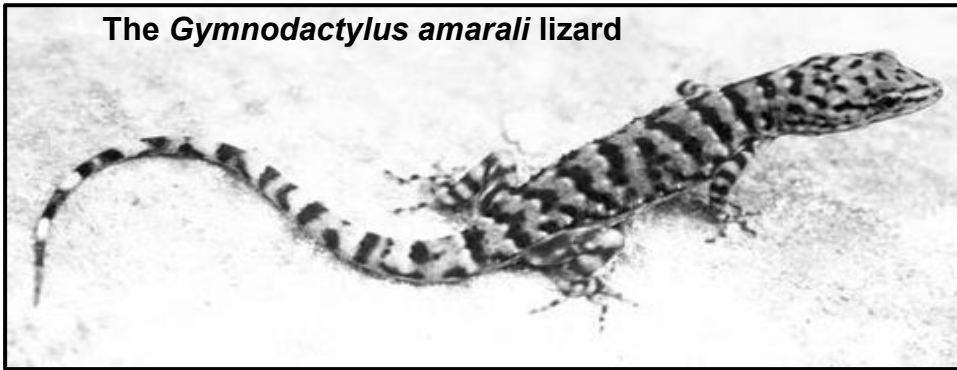
Ngo-1996 idama laseBrazil lakhukula ladala iziqithi ezininzi. Ezi ziqithi nganye zazineendidi ezahluka-hlukeneyo ezondla iintlobo ezahlukeneyo zezinambuzane.

Ukutya kwaba bukunqongophala kwaye amacikilishe amakhulu afa kwiziqithi, kuba kwakungekho kutya kwaneleyo ukuba ziphile. Kodwa icikilishe elincinci, i*Gymnodactylus amarali*, likwazile ukusinda. Zininzi iintubi elalinokuzitya.

Kodwa bekukho ingxaki: I*Gymnodactylus amarali* lizards yayineentloko ezincinci kwaye ezinye zeentubi zaziphantse zalingana nazo. Nangona kunjalo, amanye amacikilishe ayeneentloko ezithe kratya kancinci aye ayakwazi ukutya ezi ntubi.

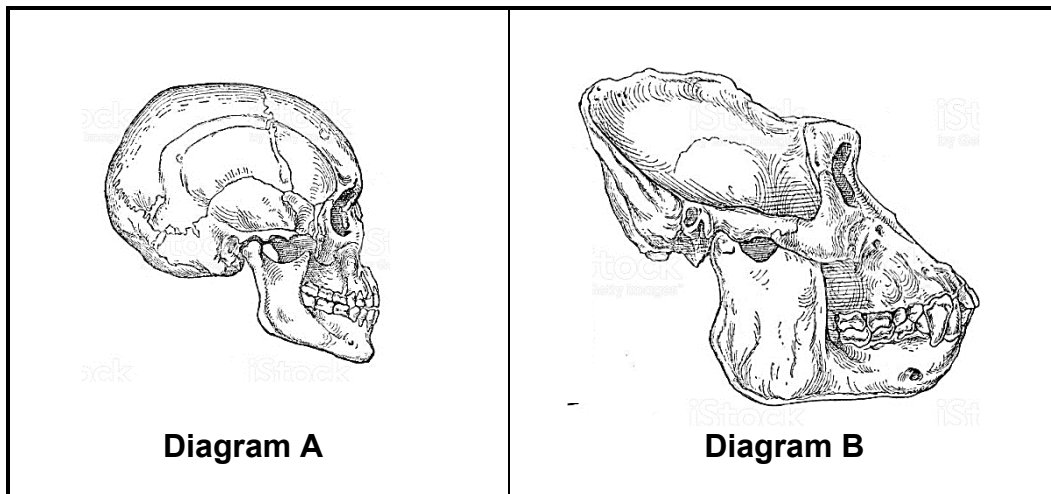
Xa oososayensi babetyelele ezi ziqithi kwiminyaka eli-15 kamva bafumanisa ukuba i*Gymnodactylus amarali* lizards eziqithini zazineentloko ezazineepesenti ezinkulu kunezo zafunyanwa kumhlaba ngaphambili.

The *Gymnodactylus amarali* lizard



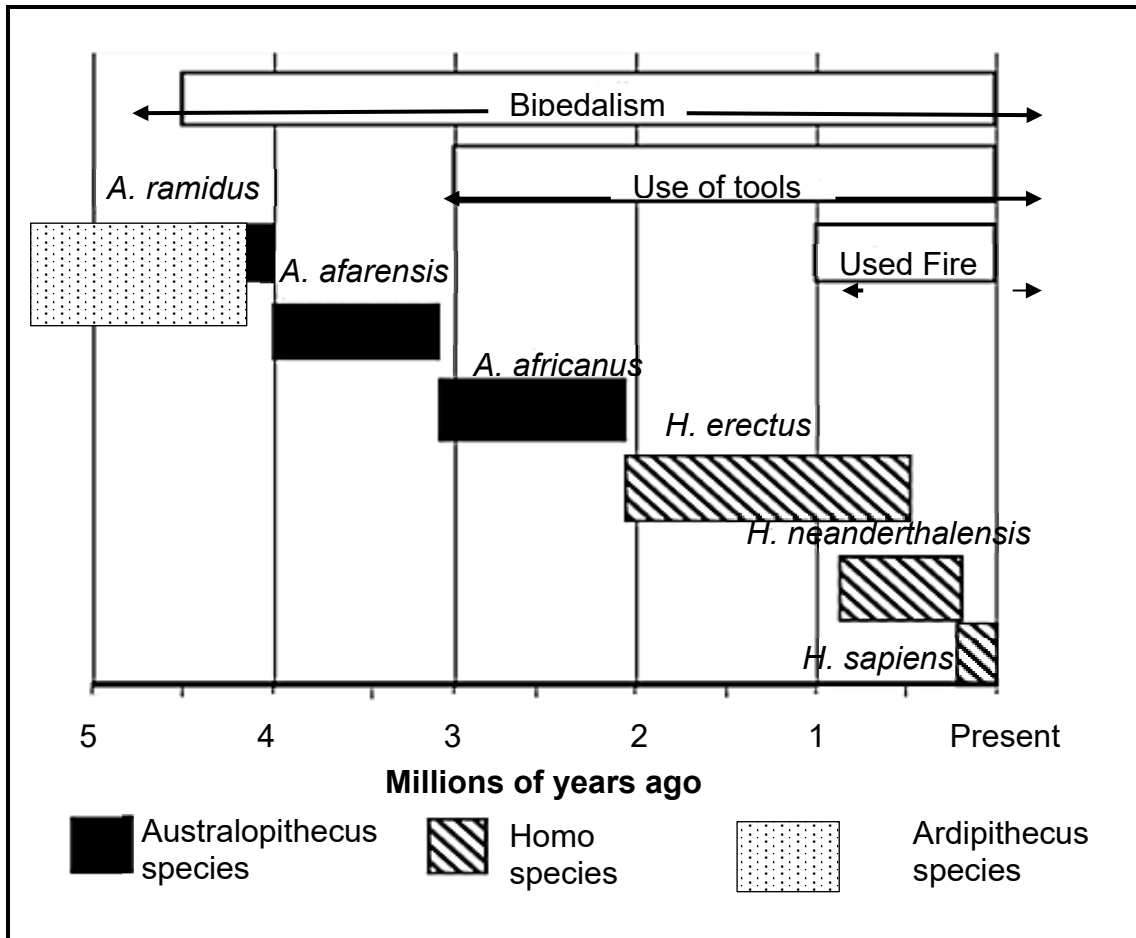
- 3.2.1 Chaza ukuba kutheni amacikilishe amakhulu engakhange aphile kwezi ziqithi zincinci. (1)
- 3.2.2 Kutheni le nto kwakungekho gene flow phakathi kwamaqela ohlukeneyo amacikilishe emva kwezikhukula (floods) ngo 1996? (2)
- 3.2.3 Sebenzisa iTheory kaDarwin ye natural selection ukucacisa ukuba ii*Gymnodactylus amarali* lizards eziqithini zineentloko ezinkulu. (5)
- 3.2.4 Chaza ukuba kungangqinwa njani ukuba uhlobo lwecikilishe kwiziqithi ezahlukeneyo luhlobo olufanayo nolwe mainland. (2)

3.3 Imizobo engezantsi ibonisa ukhakhayi kunye neeforelimbs kwi organisms ezimbini ezimbini.



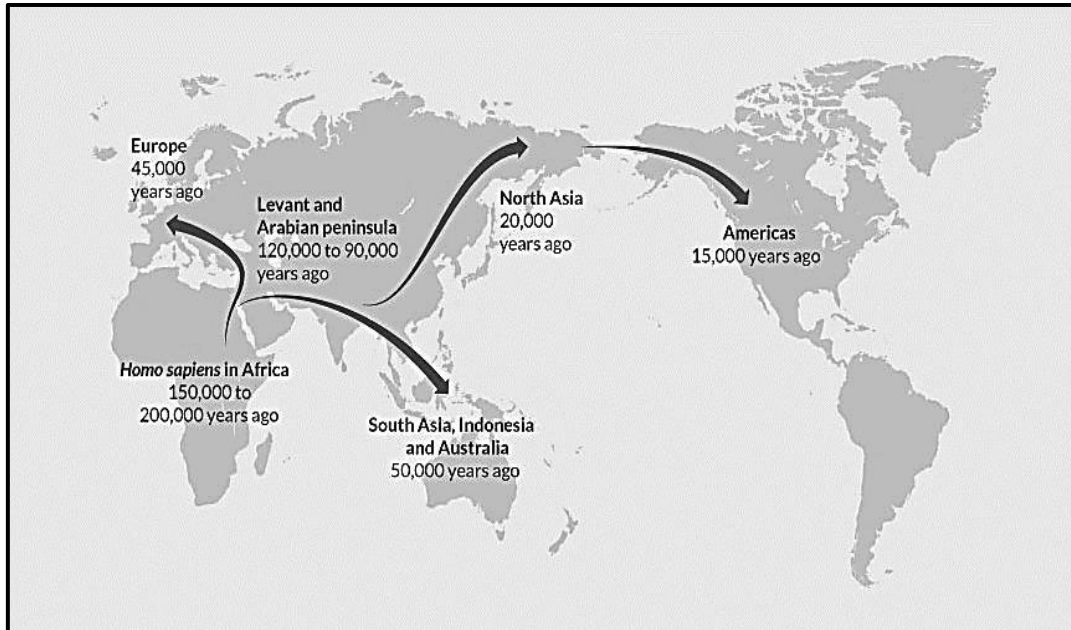
- 3.3.1 Nika igama lesience lwe organism ku dayagram **A**. (1)
- 3.3.2 Chaza ukuba kutheni amazinyo okhakhayi oluku dayagram **B** emakhulu. (2)
- 3.3.3 Ngaphandle kwamazinyo, dwelisa zibe **NTATHU** ezinye istructural differences ezibonakalayo phakathi kokhakhayi lomntu nolwe gorilla. (7)
- 3.3.4 Dwelisa zibe **MBINI** istructural similarities phakathi kwe forelimb yomntu neyegorilla. (2)

3.4 Umzobo ongezantsi ubonisa i evolution enokuba yenzeka kubantu, kunye nexesha le bipedalism, ukusetyenziswa kwezixhobo zamatye kunye nokusetyenziswa komlilo.



- 3.4.1 Nika i **genera** eziMBINI ezazi bipedal kodwa zingasebenzisi mlilo. (2)
- 3.4.2 Yabakho nini i*A.afarensis*? (1)
- 3.4.3 Zaqala nini ihominin species ukusebenzisa umlilo emva kokuba zi bipedal? (2)
- 3.4.4 Chaza zibe MBINI iskeletal changes ezenzekayo ukuvumela ibipedalism. (4)
- 3.4.5 UMrs Ples yifosili ye hominin eyafunyanwa eMzantsi Afrika ngo 1947.
 - (a) Nika igama elipheleleyo lika Mrs Ples. (1)
 - (b) Wafunyanwa phi e South Africa u Mrs Ples ? (1)
 - (c) Xela igama le scientist eyafumana u Mrs Ples. (1)

- 3.5 Imephu engezantsi ibonisa imvelaphi kunye nokuhamba kwabantu bokuqala ngokwe 'Out of Africa' hypothesis. Iminyaka yeefosili ezindala ezifumaneka kwilizwekazi ngalinye ikwabonisiwe ngezantsi kwegama.



- 3.5.1 Xela i 'Out of Africa' hypothesis. (2)
- 3.5.2 Nika iindlela eziMBINI zobungqina obusetyenzisiweyo ukuxhasa i Out of Africa hypothesis. (2)
- 3.5.3 Ngokwemephu, leliph iilizwekazi elagqibela ngokuthinjwa ngabantu bokuqala? (1)
- 3.5.4 Uthini umahluko kubudala beefossils ezazifunyanwa eAfrika kunye nezo zifunyanwa eYurophu? Bonisa KONKE ukusebenza kwakho. (2)

[50]

AMANQAKU ECANDELO B: 100
AMANQAKU EWONKE: 150