



**NATIONAL
SENIOR CERTIFICATE**

KEREITI YA 12

LOETSE 2023

LIFE SCIENCES P2

MTSHWAO: 150

NAKO: Dihora tse 2½

Pampiri ena ena le maqephe a 15.

DITAELO LE TLHAHISOLESEDING

Bala ditaelo tsena ka hloko pele o araba dipotso.

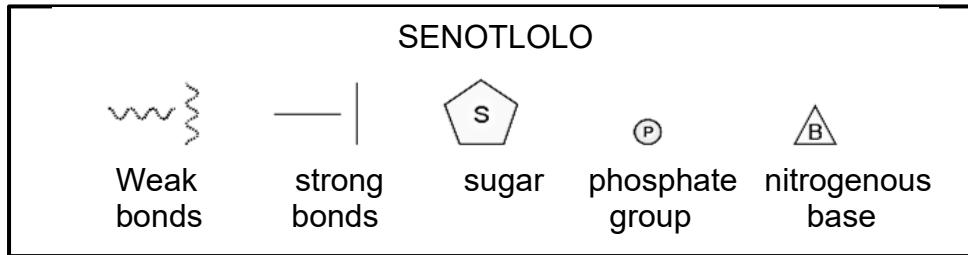
1. Araba potso KAOFELA.
2. Ngola dikarabo TSOHLE BUKENG YA DIKARABO kapa PAMPIRING e fanweng.
3. Qala karabo ya potso ka NNGWE leqepheng le LETJHA.
4. Nomora dikarabo tsa hao jwalo ka ha dipotso di nomorilwe pampiring ya dipotso.
5. Ngola dikarabo tsa hao ho latela ditaelo tse potsong ka nngwe.
6. Etsa diterowing TSOHLE ka pensele o be o di leyibele ka pene e bolou kapa e entsho.
7. Teroya didayakeramo, ditheibole kapa diflotjhate tsa FEELA ha o laetswe.
8. Didayakeramo tse pampiring ena ya dipotso HA DI A terouwa ho latela ditekanyo.
9. O SEKE wa sebedisa pampiri ya kerafo.
10. O ka sebedisa khalekhuleitha e sa porokramuwang, protraktara le khampase ha ho hlokeha.
11. Dikhalekhuleishene tsohle di lokela ho atametswa dibakeng tse pedi tsa desimale.
12. Ngola ka mongolo o makgethe o balehang.

KAROLO YA A

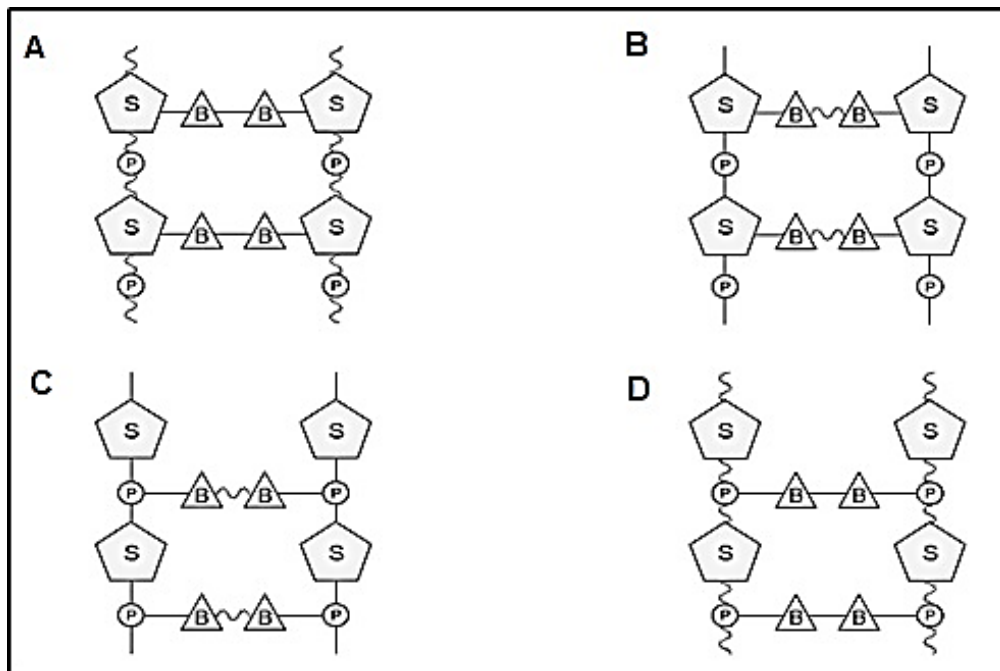
POTSO YA 1

1.1 Ho fanwe ka dikgetho tse fapaneng e le dikarabo tsa dipotso tse latelang. Kgetha karabo e nepahetseng mme o ngole feela tlhaku (A–D) haufi le dinomoro tsa dipotso (1.1.1. ho ya ho 1.1.10) BUKENG YA DIKARABO, mohlala 1.1.11 D.

1.1.1 Senotlolo se ka tlase se bontsha dikarolo tse ka sehloohong tsa molekhule wa DNA le matla a bonde a di kopanyang.



Ke dayakeramo efe ho tse latelang e bontshang motswako o nepahetseng wa dikarolo tsa molekhule wa DNA?



1.1.2 “Melao” ya Lamarck ya ho sebedisa le ho se sebedise le lefutso la matshwao a fumanweng e ...

- A e hanwa, hobane ke matshwao a ruisang bana feela a ka futswang.
- B ha e hanwe hobane bopaki bo bontsha hore matshwao a fumanweng a ka futswa.
- C e a hanwa, hobane ke matshwao a khouuweng ka hara DNA feela a ka futswang.
- D ha e hanwe, hobane theori ya Darwin e tshehetsa mohopolo wa Lamarck.

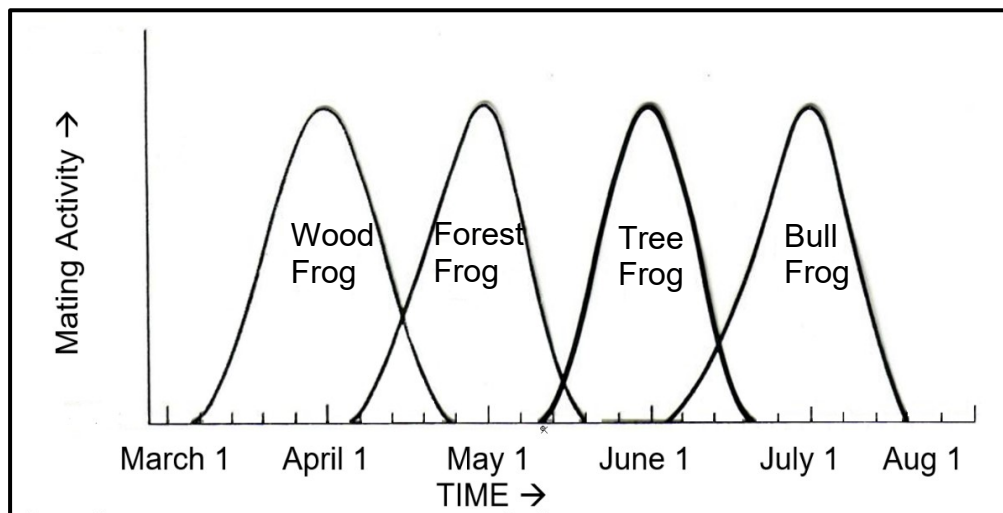
1.1.3 Trait e nang le mefuta e mengata ya difenothaepa ke mohlala wa ...

- A continuous variation.
- B discontinuous variation.
- C complete dominance.
- D codominance.

1.1.4 Down Syndrome ke sephetho sa:

- A Gamete e se nang khromosoumu 21 e kopanang le gamete e tlwaelehileng
- B Gamete e tlwaelehileng e kopanang le gamete e nang le khromosoumu 21 e eketsehileng.
- C Di-gamete tse pedi e nngwe le e nngwe e nang le khromosoumu 21 e eketsehileng di kopana hammoho
- D Ho na le dikhromosoumu 21 tse 3 ka hara gamete

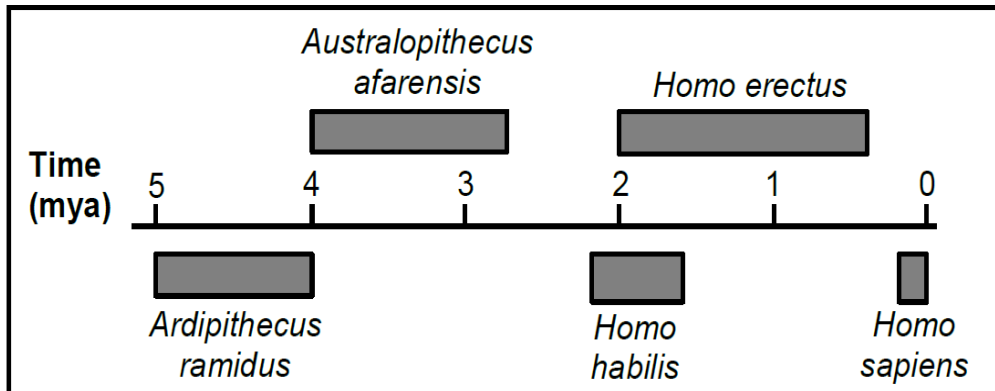
1.1.5 Kerafo e ka tlase e bontsha dinako tsa ho tswala ha mefuta e fapaneng ya senqanqane.



Kerafo e ka hodimo e bontsha mohlala wa ...

- A biogeography.
- B natural selection.
- C speciation.
- D reproductive isolation.

1.1.6 Ke mofuta ofe wa hominin o qetileng nako e telele ka ho fetisisa lefatseng ho latela thaemlaene e ka tlase?



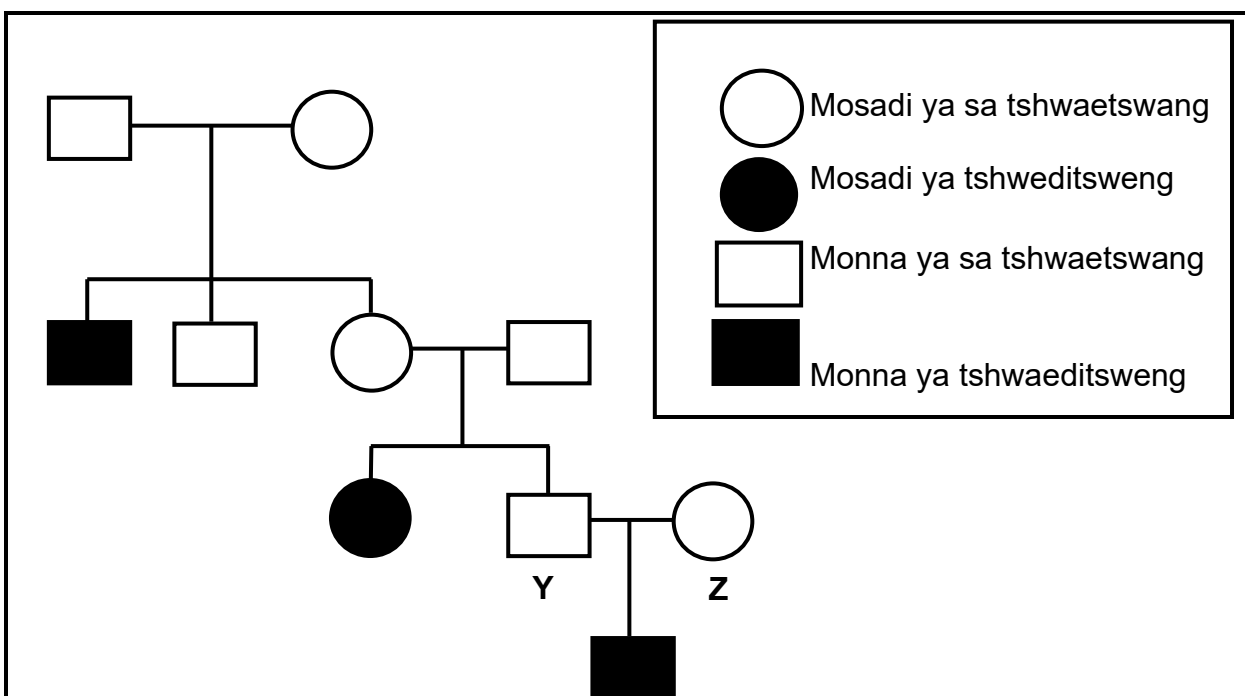
- A *Homo erectus*
- B *Ardipithecus ramidus*
- C *Australopithecus afarensis*
- D *Homo sapiens*

1.1.7 Ho ditweba, boya bo bosootho bo bongata ho feta boya bo bosweu. Haeba tweba e heterozygous brown e kopantswe ka makgetlo a mangata le tweba e tshweu mme ho hlahiswa madinyane a 80, ke madinyane a makae a ka lebellwang hore a tla ba masweu?

- A 80
- B 40
- C 0
- D 20

DIPOTSO 1.1.8 LE 1.1.9 DI LEBISITSE HO PEDIGREE DAYAKERAMO E LATELANG.

Boswefe ke bofokodi ba letlalo bo bakwang ke resesive alele ho otosoumu. Pedigree dayakeramo e ka tlase e emetse lefutso ya boswefe ka lapeng.



1.1.8 Ke dijeneraishene tse kae tse emetsweng ke dayakeramo e ka holimo?

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

1.1.9 Monyetla wa hore batho ba **Y** le **Z** ba be le ngwana wa leswefe ke ...

- A 25%
- B 50%
- C 75%
- D 100%

1.1.10 Dintho tse homologous di bontsha hore ...

- A dibopeho tse fumanwang ho dichromatid ka bobedi.
- B dioganisimo di fumane alele e tshwanang ho batswadi ka bobedi.
- C dioganisimo di na le moholoholo ya tshwanang.
- D dioganisimo di sebedisa sebopeho bakeng sa mosebetsi o tshwanang.

(10 x 2) (20)

1.2 Fana ka lentswe le nepahetseng **la baoloji** bakeng sa tlhaloso ka nngwe ya tse latelang. Ngola feela lentswe pela nomoro ya potso (1.2.1–1.2.8) ka BUKENG YA KARABO.

1.2.1 Dibopeho tse fumanwang ho nyutleliyase tse entsweng ka molekhule ya DNA le diprotheine

1.2.2 Karolo ya molekhule wa DNA e khethollang tshobotsi e itseng

1.2.3 Rasaense ya ileng a etsa tlhahiso ya molawana wa assortment e ikemetseng

1.2.4 Bonde e pakeng tsa diamino asiti tse pedi

1.2.5 Majwana a kaho (monomers) a DNA

1.2.6 Disele tsa diphoofolo tse sa khetholleheng tse nang le bokgoni ba ho fetohela mofuteng ofe kapa ofe wa sele

1.2.7 Ho ba le mohlahare o ka hodimo kapa ka tlase o hlahellang ka tsela e sa tlwaelehang

1.2.8 Tlhaloso ya hore dispesis di na le nako e telele ntle le phetoho ya mmele, e latelwa ke nako e khutswanyane ya phetoho e potlakileng ya mmele

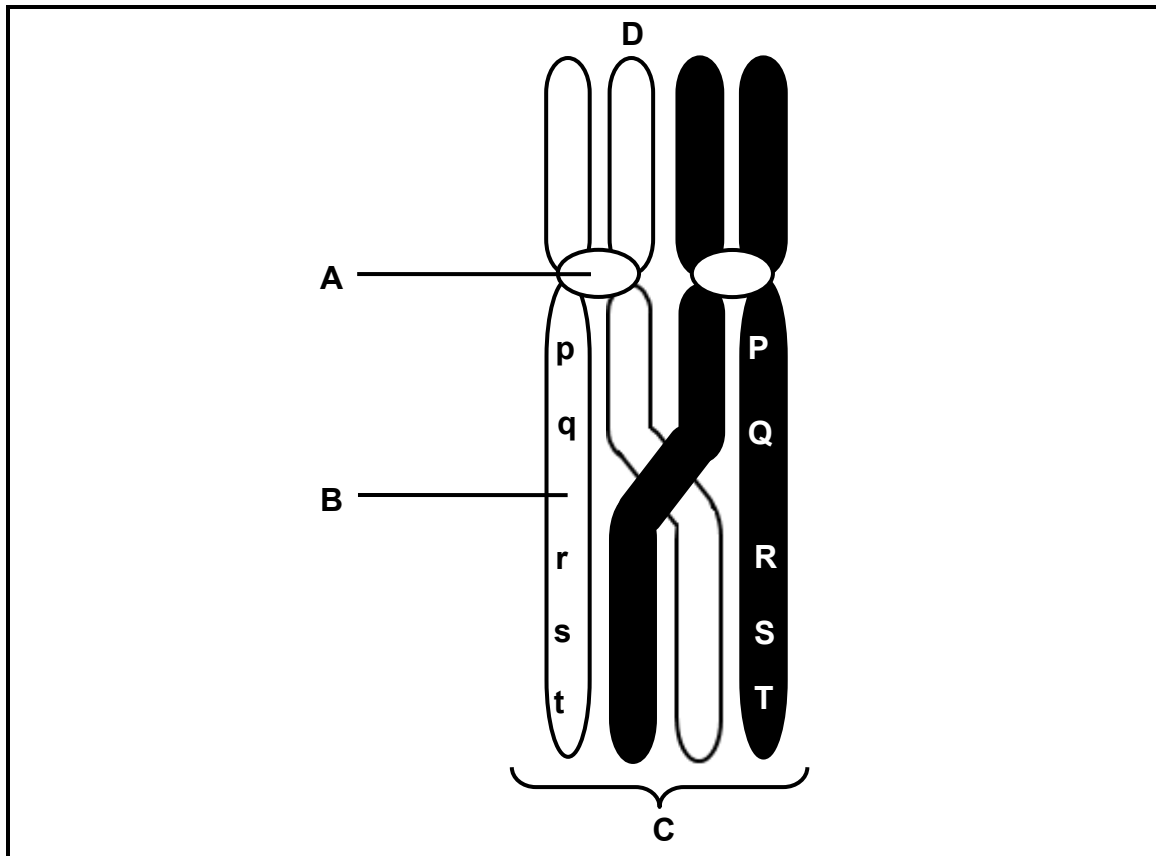
(8 x 1) (8)

1.3 Bontsha hore na ditlhaloso tse ho KHOLOMO YA I di tsamaelana le tse ho **A FEELA, B FEELA, A le B KA BOBEDI** kapa **HA E YO** ho tse ho KHOLOMO YA II. Ngola **A feela, B feela, A le B KA BOBEDI**, kapa **ha e yo** haufi le nomoro ya potso (1.1.3–1.3.3) BUKENG YA DIKARABO.

KHOLOMO YA I		KHOLOMO YA II	
1.3.1	E etswa ke jene mutheishene	A:	Haemophilia
		B:	Down Syndrome
1.3.2	Somatic sele	A:	Haploid
		B:	Skin cell
1.3.3	Dialele tse hlahiswang feela ha dikopi tse pedi di le teng.	A:	Recessive
		B:	Heterozygous

(3 x 2) (6)

1.4 Ithute dayakeramo ya dikhromosoumu tse pedi tse ka tlase.



1.4.1 Bolela porosese e etsahalang ho dayakeramo e ka hodimo. (1)

1.4.2 Porosese e etsahala nakong efe ya meiosis? (1)

1.4.3 Fana ka dileibele bakeng sa dikarolo tse latelang:

(a) **A** (1)

(b) **B** (1)

(c) **C** (1)

1.4.4 Teroya chromatid **D** qetellong ya meiosis. (3)

- 1.5 Ho mebutlanyana ho ile ha ithutwa matshwao a mabedi a lefutso, mmala wa moriri le wa mahlo. Letshwao ka leng ho ana le na le divarieishene tse pedi.

Moriri o ka ba o moputswa kapa o mosweu mme mahlo a ka ba matsho kapa a a ba makgubedu ka mmala. Disimbole **G** le **g** di sebediswa bakeng sa divarieishene tse pedi tsa mmala wa moriri mme disimbole **B** le **b** di sebediswa bakeng sa divarieishene tse pedi tsa mmala wa mahlo.

Ha mebutlanyana e mmedi e neng e le heterozygous bakeng sa mmala wa moriri le mmala wa mahlo e ne e croswa, ho ile ha fumanwa ditlamorao tse latelang:

Palo ya madinyane	Matshwao
Moriri o moputswa le mahlo a Matsho	9
Moriri o moputswa le mahlo a Mafubedu	3
Moriri o mosweu le mahlo a Matsho	3
Moriri o mosweu le mahlo a Mafubedu	1

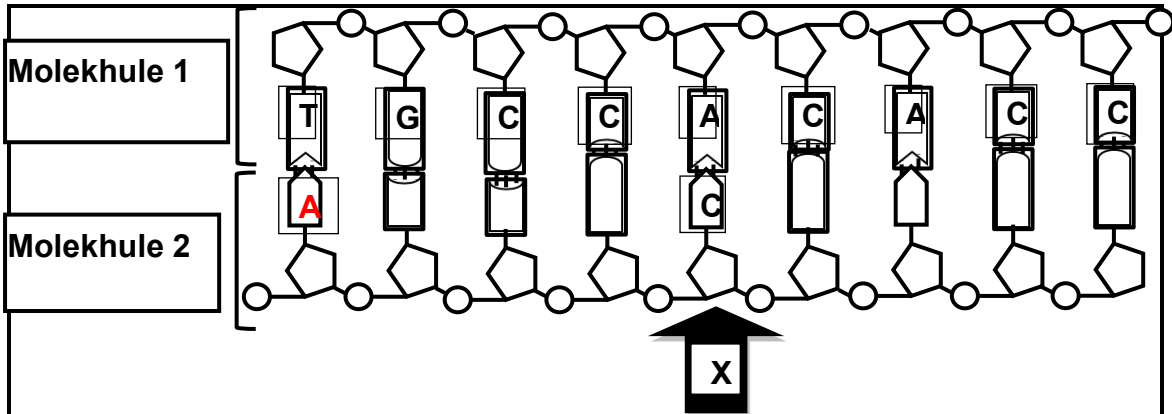
- 1.5.1 Bolela lentswe bakeng sa jenetic cross e amang ditshobotsi tse pedi. (1)
- 1.5.2 Fana ka digamete tsohle tse ka kgonehang tsa batswadi? (2)
- 1.5.3 Fana ka:
- (a) Alele e ngata bakeng sa mmala wa moriri (1)
- (b) Jenothaepe bakeng sa mmutla o moriri o mosweu le mahlo a makgubedu (2)
- (c) Fenothaepe ya mmutla o heterozygous bakeng sa mmala wa moriri le homozygous e ngata bakeng sa mmala wa mahlo (2)

MATSHWAO A KAROLO YA A: 50

KAROLOYA B

POTSO YA 2

2.1 Dayakeramo e ka tlase e bontsha karolo ya porosese e amehang ho etsweng ha protheine.



2.1.1 Fana ka lebitso la:

(a) Molekhule 1 (1)

(b) Molekhule 2 (1)

2.1.2 Bolela porosese e bontshitsweng setshwantshong se ka hodimo. (1)

2.1.3 Porosese e boletsweng ho POTSO YA 2.1.2 e etsahala ka hara oganele efe seleng? (1)

2.1.4 Fana ka tatellano ya nucleothaete bakeng sa molekhule 2. Ngola tatellano e felletseng ho tloha ho le letshehali ho ya ho le letona (ho qala ka beisi **A** e fanweng). (3)

Theibole e ka tlase e bontsha di-amino asiti tse khoutuweng bakeng sa anticodon ka nngwe ya tRNA.

tRNA anticodon	Amino Asiti
GAA	Leucine
CUU	Lycine
GGA	Glycine
UGC	Cystine
CGC	Alanine
UAC	Tyrosine
AGG	Arginine
CAC	Valine
ACC	Threonine

2.1.5 Sebedisa theibole ho fumana tatellano ya amino asiti, ho tloha ho le letshehadi ho ya ho le letona, e khoutetsweng **molekhule 1**. (3)

2.1.6 Hlalosa hore na phoso ntlheng ya **X** ho **molekhule 2** e tla fetola protheine e hlahang jwang. (4)

2.2 Bala qotso e ka tlase:

Congenital night blindness ke bofokodi bo amanang le pherekano ya sex. E bakwa ke recessive jene ho X-khromosoumu. Batho ba bofokodi bona ha ba bone hantle bosiu mme ba ba le mathata a ho bonela haufi le ho lahlehelwa ke pono e ntjhotjho. Sebedisa (N) bakeng sa pono e tlwaelehileng ya bosiu le (n) bakeng sa congenital night blindness.

2.2.1 Bolela:

(a) Jenothaepe ya alele e bakang congenital night blindness. (1)

(b) Jenothaepe ya mosetsana ya nang le congenital night blindness (2)

2.2.2 Fana ka mabaka a MABEDI ao ka ona batho ba nang le lefu lena ba ke keng ba kgona ho fumana lengolo la ho kganna. (2)

2.2.3 Monna ya tswetsweng a na le congenital night blindness o na le mora le mosadi ya se nang alele:

(a) Fana ka fenothaepe ya mora wa bona (1)

(b) Hlalosa karabo ya hao ho POTSO 2.2.3(a) (3)

2.3 Mosadi e mong o ile a bolela hore ke banna ba babedi bao e ka bang ntate wa ngwana wa hae. Ka tlase ke diphetho tsa diteko tsa phathenithi porofaele ya DNA le diteko tsa phathenithi ya madi.

Diphetho tsa diteko tsa madi		Diphetho tsa porofaele ya DNA			
	Mofuta wa madi	Lesea	Mme	Ntate 1	Ntate 2
Lesea	O	████████	████████	████████	████████
Mme	B	████████	████████	████████	████████
Ntate 1	AB	████████	████████	████████	████████
Ntate 2	A	████████	████████	████████	████████

2.3.1 O sebelisa diphetho tsa porofaeleng ya DNA, hlalosa hore na ke hobaneng ha **Ntate wa 2** e le ntate wa leseae. (3)

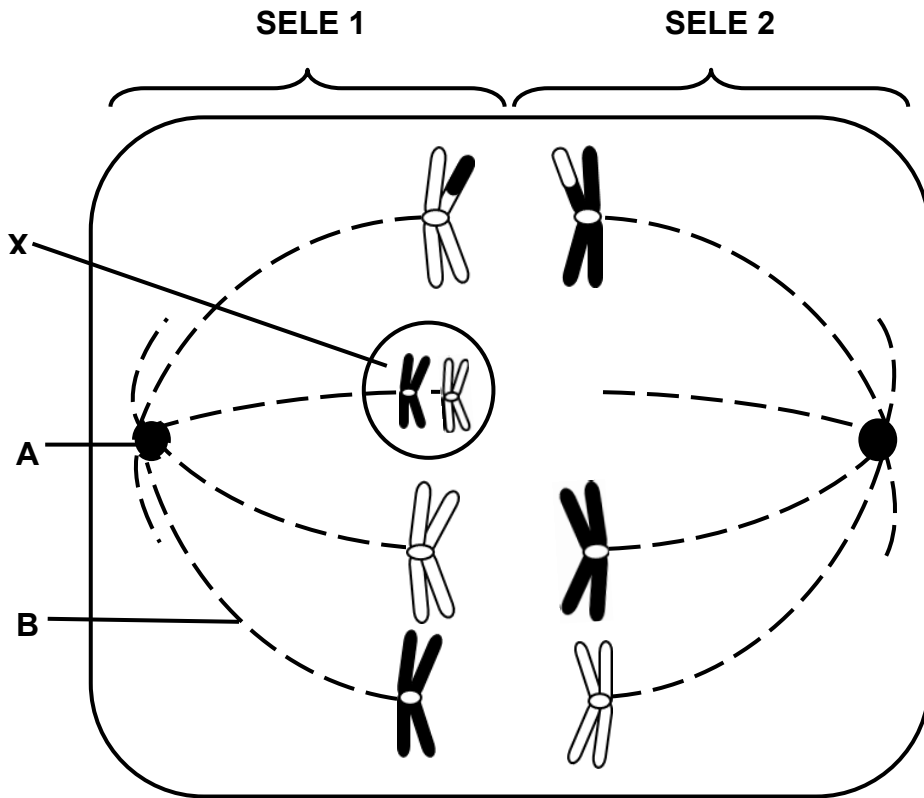
2.3.2 Hlalosa hore na ke hobaneng ha **Ntate wa 1** e ke ke ya eba ntate wa ngwana ho sebediswa diphetho tsa diteko tsa madi. (3)

2.3.3 Sebedisa jenetic cross ho bontsha monyetla wa peresente ya mme le **Ntate wa 2**, ho ba le ngwana ya nang le mofuta wa madi wa O. (6)

2.3.4 Hlalosa hore na ke hobaneng ha dipheho tsa tlhahlobo ya madi di sa tshepahale ho fumana hore na ke ntate. (2)

2.3.5 Bolela ditshebediso tse ding tse PEDI tsa p orofaeleng yaDNA ntle le diteko tsa bontate. (2)

2.4 Dayakeramo e ka tlase e bontsha sele ka nako ya meiosis.



2.4.1 Fana ka mokgahlelo wa meiosis o bontshitsweng ho dayakeramo e ka hodimo. (1)

2.4.2 Fana ka lebaka le le LENG la karabo ya hao ho POTSO YA 2.4.1. (1)

2.4.3 Fana ka mesebetsi ya dikarolo tse latelang ho meiosis:

(a) **A** (1)

(b) **B** (1)

2.4.4 Bolela mofuta wa khromosomal muteishene e etsahalang ho **X**. (1)

2.4.5 Hlalosa diporosese tse PEDI tse bontshitsweng ho dayakeramo e lebisang ho varieishene ho bana. (4)

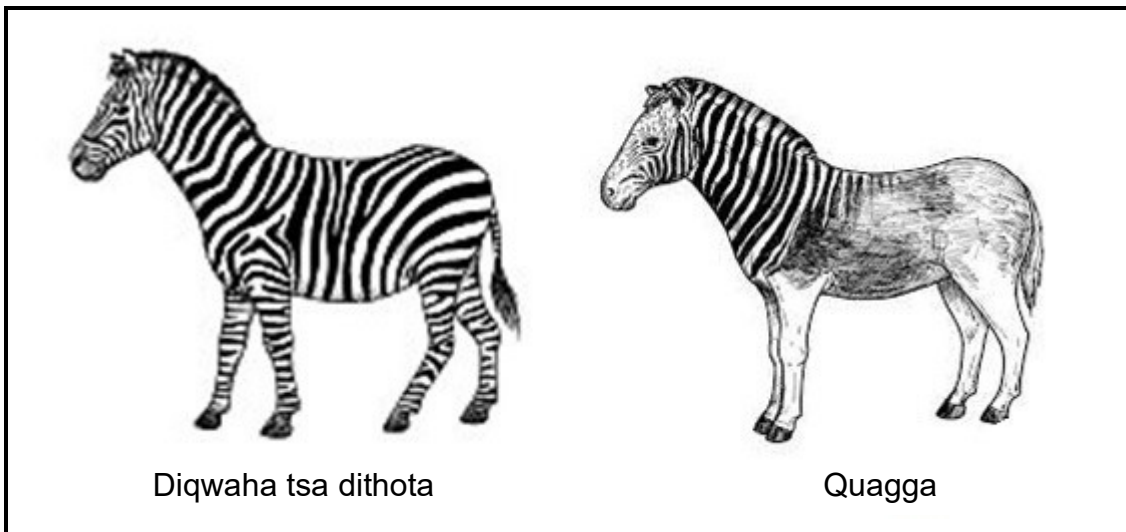
2.4.6 Ke dikhromosoumu tse kae tse tla fumanwa ho SELE 2 qetellong ya meiosis? (2)

[50]

POTSO YA 3

3.1 Bala qotso e ka tlase.

Quagga e ne e le mofuta o monyenyanane wa diqwaha tsa thota. Di ile tsa tsongwa ho fihlela di timela sentjhuring ya bo19. Di ne di le mmele e mekgutshwane e sephara ho feta qwaha ya dithota mme di boya bo bosootho bo lerotho bo matshwao a matsho. Diqwaha tsa dithota di boya bo bosoeu bo matshwao a matsho mmele ohle. Quagga e ne e le mela feela bokapeleng ba mmele. Bo-rasaense ba nnile ba tswadisa diqwaha tsa dithota tse ditshobotsi di tshwanang le tsa quagga mme hona jwale ba hlahisitse diphoofole tse ka bang 200 tse tshwanang le quagga e seng e fedile Afrika Borwa.

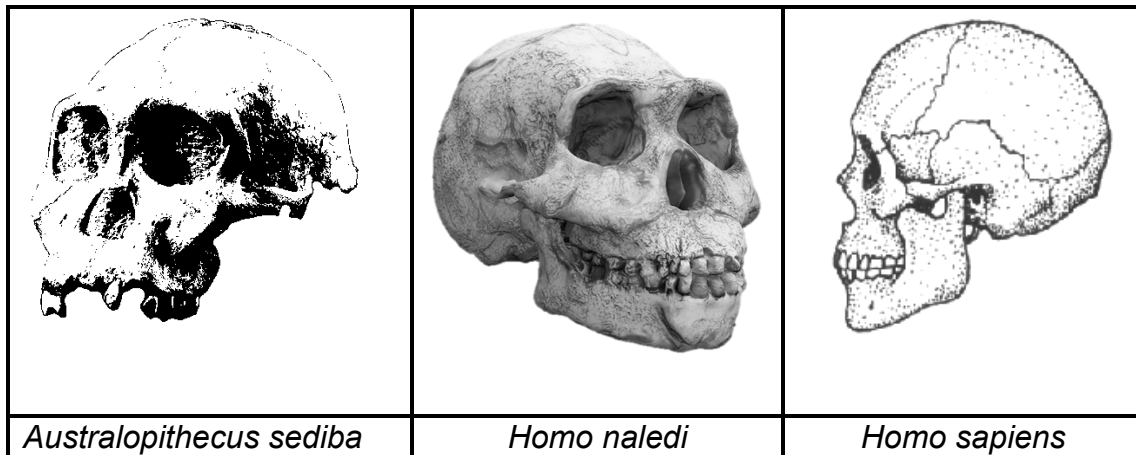


Diqwaha tsa dithota

Quagga

- 3.1.1 Bolela porose o sebediswang ke borasaense ho tswadisa quagga. (1)
- 3.1.2 Ho tswa qotsong, fana ka ditshobotsi tse PEDI tseo borasaense ba di batlang ho diqwaha tsa dithota tseo ba di tswadisang. (2)
- 3.1.3 Borasaense ba ka tseba jwang hore na quagga e ntse e le mofuta o tshwanang le wa diqwaha tsa thota? (2)
- 3.1.4 Hlalosa hore na ekstinkshene e ka ba le ditlamorao tse ntle jwang ho biodaevesithi. (2)

3.2 Ka 2012, Moprofesa Lee Berger o ile a sibolla mofuta o motjha wa hominin, o ileng wa bitswa *Australopithecus sediba*. Dilemo tse tharo ha morao, ka 2015, ho ile ha sibollwa mofuta o mong o motjha wa hominin. Mofuta ona o motjha o ile oa bitswa *Homo naledi*. Difossil tsa mofuta ena ka bobedi ya hominin e ile ya fumanwa sebakeng sa Afrika Borwa se tsejwang e le 'Cradle of Humankind'.



- 3.2.1 Ke difossil dife ho tse pedi (*Australopithecus sediba* kapa *Homo naledi*) eo ho nahanwang hore e amana haufiufi le batho ba kajeno? (1)
- 3.2.2 Fana ka lebaka le LE LENG la karabo ya hao POTSO YA 3.2.1. (1)
- 3.2.3 Hlalosa matshwao a MARARO a anatomi ao Moprofesa Berger a neng a tshwanela ho a sheba ha a hlahloba difossil, ho fumana hore *Australopithecus sediba* e ne e le bipedal. (3)
- 3.2.4 Fana ka lebitso la saense la mofuta o LE MONG wa hominin oo fossil ya yona e ileng ya sibollwa Cradle of Humankind. (1)
- 3.2.5 Hobaneng sebaka see se bitsoa 'Cradle of Humankind'? (2)
- 3.2.6 Hlalosa hore na mitochondrial DNA e sebediswa jwang ho paka hore batho ba kajeno ba qadile Afrika. (4)

- 3.3 Theori ya evolushene e itshetlehlile ka bopaki bo bongata.
 - 3.3.1 Hlalosa biological evolushene. (2)
 - 3.3.2 Ke hobaneng ha Theori ya Evolushene e nkwa e le theori ya saense? (2)
 - 3.3.3 Hlahisa phapano e le NNGWE dipakeng tsa theori le haepothesis. (3)
 - 3.3.4 Bolela mehlodi e MEBEDI moo borasaense ba fumanang bopaki ba ho evolushene. (2)

3.4 Dimela tsa poone di angwa ke seboko sa poone sa Europe e leng seboko se senyenyane se jang semela sa poone mme se baka tshenyo ya dijalo tsohle bakeng sa dihwai. Mofuta wa jene ya Bt o fumanwang ka hara baktheria o hlahisa tjhefo e bolayang seboko sa poone sa Europe ntle le ho lematsa batho. Borasaense ba kgonne ho ntsha jene ena ho baktheria le ho e kenya ho DNA ya dimela tsa poone. Ha seboko sa poone sa Europe se ja semela sa poone, se tla shwa kapelepele

3.4.1 Bolela porosese eo dijene tsa oganizimo di fetolwang ho kenyelletsa tshobotsi e ntjha. (1)

3.4.2 Fana ka lentswe le bolelang DNA eo jene e kentsweng ho yona. (1)

3.4.3 Hlalosa tsela e LE NNGWE eo poone e nang le mofuta wa Bt e ka ruisang dihwai molemo ka yona. (2)

3.4.4 Hlalosa lebaka le le LENG hore hobaneng ho sebedisa dijene tsa Bt ho dimela tsa poone ho ka ba le ditlamorao tse mpe tikolohong. (2)

3.5 Afrika Borwa, baktheria ya tuberculosis e ile ya hanana le dipheko tse ngata tse tlwaelehileng tsa TB. Rifampicin ha jwale ke sethetefatsi se sebetsang ka ho fetisisa ho phecola TB. Le ha ho le jwalo ho na le mofuta e mengata ya baktheria ya tuberculosis e seng e hanana le setlhare sena hape. Baktheria e hlolang Rifampicin e ka phekolwa ka bedaquiline.

Mefuta e mmedi ya pheko ya bedaquiline e a fumaneha:

- Dipidisi tse ka nowang hae letsatsi le letsatsi
- Ente moo mokudi a tlamehang ho kgutlela tleliniking beke e nngwe le e nngwe bakeng sa ente.

Rasaense o ne a batla ho fumana hore na ke pheko efe e tla ba le tekanyo e phahameng ka ho fetisisa ya ho phela ka mora dikgwedi tse 24.

- Bankakarolo ba 200 ba nang le TB e hlolang rifampicin bai le ba kgethwa
- Bankakarolo bohle ba ne ba le dilemo di 18 kapa ho feta.
- Bakudi ba 100 ba ile ba fuwa pheko ya pidisi ka dikgwedi tse 9.
- Bakudi ba 100 ba ile ba fuwa pheko ya ente dikgwedi tse 9.
- Boemo ba bona ba bophelo bo ile ba lekannngwa dikgwedi tse 24 ka mora hore ba qale pheko.

Theiobole e ka tlase e bontsha katleho ya dipheko tsena tse pedi.

Treatment	Number of participants that had recurrence of TB	Number of participants that did not complete the treatment	Number of participants that died of TB	Number of Participants that were cured of TB
Tablets	1	4	24	71
Injection	2	12	28	X

- 3.5.1 Fana ka variebole e ikemetseng. (1)
- 3.5.2 Fana ka lebaka le le LENG hobaneng thuto e ka nkwa e tshepahala. (1)
- 3.5.3 Khalekhuleitha lenane la bankakarolo ba fumantshitsweng pheko ya ente mme ba fola TB. (3)
- 3.5.4 Hlalosa lebaka le le LENG leo ka lona batho ba bangata ba sa kang ba qeta pheko ya ente. (2)
- 3.5.5 Hlalosa kamoo baktheria ya tuberculosis e ka nnang ya ba e tswetse pele ho hanyetsa rifampicin ho latela Theori of Natural Selection ya Darwin. (5)
- 3.5.6 Fana ka ditsela tse PEDI tseo borasaense ba ka ntlafatsang bonnete ba thuto ena. (2)
- 3.5.7 Hlalosa hore na ke hobaneng ha boemo ba bophelo ba bankakarolo bo ile ba rekotwa feela ka mora dikgwedi tse 24 tsa pheko. (2)

[50]**MATSHWAO A KAROLO YA B: 100****MATSHWAO OHLE: 150**