



Province of the
EASTERN CAPE
EDUCATION

**NATIONAL
SENIOR CERTIFICATE**

KEREITI 12

LWETSE 2021

**DISAENSE TSA BOPHELO P2
TATAISO YA HO TSHWAYA**

MATSHWAO: 150

Tatayiso yena ya ho tshwaya e na le maqephe a-10.

MELAWO MOTHEO E EMAHANG TSHAWO TSA BOPHELO

1. **Haeba ho fanwa ka lesedi le fetang la dimaraka tse fanweng**
Emisa ho tshwaya ha matshwao a hodimo a fihletswe ebe o beha mola wa wavy le 'max' ka lehlakoreng le letona la letsoho le letona.
2. **Haeba, ho etsa mohlala, ho hlokahala mabaka a mararo mme ho fanwe ka a mahlano**
Tshwaya tse tharo tsa pele ho sa tsotelehe hore na kaofela kapa tse ding di nepahetse / di fosahetse.
3. **Haeba tshebetso yohle e fanwa ha ho hlokahala feela karolo ya yona**
Bala tsohle mme o fane ka dimaraka karolo e amehang
4. **Haeba tshebetso yohle e fanwa ha ho hlokahala feela karolo ea yona** Bala tsohle mme o fane ka dimaraka karolo e amehang.
5. **Haeba ho etsa tabole ho hlokahala, empa ho fanwe ka lirapa**
Baithuti ba tla lahlehelwa ke dimaraka ka ho se kenye tabole.
6. **Haeba ditshwantshwo di fanwa ka ditlhaloso ha ditlhaloso li hlokahala**
Baithuti ba tla lahlehelwa ke dimaraka.
7. **Haeba ditjhate tsa phallo di fanwa ho fapana le ditlhaloso** Baithuti ba tla lahlehelwa ke dimaraka.
8. **Haeba tatellano e sithabeditswe mme dihokela ha di utlwahale** Moo tatellano le dihokela di nepahetseng, fana ka dimaraka. Ha tatellano le dihokela di fosahetse, o se ke wa fana ka dimaraka. Haeba tatellano le dikgokahano di nepahala hape, qalella ho fana ka dimaraka
9. **Dikgutsufatso tse sa tsejweng**
Amohela haeba e hlalositswe pele. Haeba e sa hlaloswa, o se ke wa fana ka dimaraka ka kgutsufatso e sa tsejweng, empa fana ka dimaraka karolong e setseng haeba e nepahetse.
10. **Dinomoro tse fosahetseng**
Haeba karabo e dumellana le tatellano e nepahetseng ya dipotso, empa ho fanwe ka nomoro e fosahetseng, hwa amohela.
11. **Haeba puo e sebedisitsweng e fetola moelelo o rerilweng**
Se ke wa amohela.
12. **Diphoso tsa mopeleto**
Haeba e tsebahala, amohela karabo, ha feela e sa bolele ho hong ho Saense ea Bophelo kapa haeba e sa tsamaellane le maemo.
13. **Haeba mabitso a tlwaelehileng a fanwa ka mantsee**
Amohela, ha feela e ka amohelwa kopanong ea naha ea dipuisano.
14. **Haeba ho botswa feela tlhaku, empa ho fanwa ka lebitso feela (le ka tsela e fapaneng)** Se ke wa fana ka dimaraka

15. **Haeba dikarolo di sa fanwe ka ditekanyo**
Baithuti ba tla lahlehelwa ke dimaraka. Tataiso ea ho tshwaya e tla fana ka matshwao bakeng sa di-unit ka thoko.
16. **Ela hloko kutlwisiso ya karabo, e ka buwang ka tsela e fapaneng**
17. **Tlhaloso**
Dipapiso tsohle (ditshwantsho, digrafo, di tabole jj) di tlameha ho ba le Sehlooho
18. **Ho fetola khoutu ya dipuwo tsa semmuso (dipolelo le dikhopolo)** Lentswe le le leng kapa a mabedi a hlahang (dipuong) ka puwo efe kapa efe ya semmuso ntle le puwo ya tekolo ya moithuti e sebelisitsweng haholo ho dikarabo tsa haye a lokela ho fuwa tlotla, hayeba e nepahetse. Lesupa le tsebahalang ka puwo ya semmuso e loketseng le lokela ho botswa. Sena se sebetsa lipuwong tsohle tsa semmuso.

KAROLO A**POTSO 1**

- | | | | |
|-----|--------|---|--------------------------|
| 1.1 | 1.1.1 | C ✓✓ | |
| | 1.1.2 | D ✓✓ | |
| | 1.1.3 | A ✓✓ | |
| | 1.1.4 | B ✓✓ | |
| | 1.1.5 | D ✓✓ | |
| | 1.1.6 | A ✓✓ | |
| | 1.1.7 | C ✓✓ | |
| | 1.1.8 | B ✓✓ | |
| | 1.1.9 | B ✓✓ | |
| | 1.1.10 | B ✓✓ | (10 x 2) (20) |
| 1.2 | 1.2.1 | Phenotype ✓ | |
| | 1.2.2 | Autosomes ✓ | |
| | 1.2.3 | Chiasmata ✓/chiasma | |
| | 1.2.4 | Gene ✓ | |
| | 1.2.5 | Transcription ✓ | |
| | 1.2.6 | Cloning ✓ | |
| | 1.2.7 | Homologous ✓ chromosomes | |
| | 1.2.8 | Locus ✓ | (8) |
| 1.3 | 1.3.1 | B fela ✓✓ | |
| | 1.3.2 | Ka bobedi A le B ✓✓ | |
| | 1.3.3 | B fela ✓✓ | (6) |
| 1.4 | 1.4.1 | Meiosis ✓ | (1) |
| | 1.4.2 | Metaphase 1 ✓ | (1) |
| | 1.4.3 | (a) B ✓ | (1) |
| | | (b) F ✓ | (1) |
| | | (c) D ✓ and E ✓ | |
| | | (Tshwaya tsa pele tsepedi feela) | (2) |
| | 1.4.4 | 4 ✓/ tse ne | (1) |
| | 1.4.5 | Sperm ✓ / (not gamete)/ spermatozoa | (1) |
| 1.5 | 1.5.1 | Million years ago ✓ | (1) |
| | 1.5.2 | (a) C ✓/A | (1) |
| | | (b) A ✓ | (1) |
| | | (c) B ✓ | (1) |
| | 1.5.3 | Dikhopolo tse fapaneng tse amanang le ho iphetola hwa dintho di nile tsa lekwa le ho netefatswa ka mora nako ✓/ e bile le diteko tse maloa me e tsehedswe ke bopaki | (1) |
| | 1.5.4 | - Biogeography ✓
- Genetics ✓
- Modification by descent ✓/homologous structures
(Tshwaya tse THARO feela) | (Efe kapa efe 3 x 1) (3) |

KAKARETSO YA KAROLO A: 50

POTSO 2

- 2.1 2.1.1 A – Centromere ✓ (1)
- 2.1.2 DNA Replication ✓ (1)
- 2.1.3 - Molek'hule ya DNA ya phutholoha ✓
 - Le unzips ✓ / khedu e fokolang ya haedrojene
 - Khwele ka ngwe e sebetsa jwalo ka ditempele ✓
 - Di nucleotide tsa mahala tse phaphametseng ka hara nucleoplasm ✓
 - Ikopanye le sehlopha sa bona sa tlatsetso / base pair / (TA; CG)
 - Ho etsa dikhwele tse pedi tse tswanang tsa DNA ✓
 (Efe kapa efe 4 x 1) (4)
- 2.1.4 - Hlahisa dikopi tse pedi hantle tsa disele / DNA ✓ / dichromosome
 - Hore sele e ngwe le e ngwe e ncha e entsweng ka mitosis e na le
 diphatsa tsa lefutso / dipalo tse lekanang hantle le DNA jwalo ka sele
 ya motswadi ✓ / dichromosome (2)
- 2.2 2.2.1 Seta 2 ✓ (1)
- 2.2.2 Lihlopha(di bands) tsohle tsa lesiya tse sa dumellaneng le ntate 2 di
 bapisa mme 2 ✓✓
- KAPA**
- Mekwallo **yohle** ya DNA ya ngwana e tswana le ya ntate 2 le mme
 2 ✓✓
- KAPA**
- Dihlopha tsa batswadi ba bang ha di tswane le dihlopha **tsohle** tsa
 lesiya ✓✓ (2)
- 2.2.3 Madi ✓
 sele ya letlalo ✓ or nama ya motho
 sele ya moriri ✓
 mathe ✓
Tshwaya tse pedi feela (Efe kapa efe 2 x 1) (2)
- 2.2.4 Bopaki ba bayoloji dipatlisong tsa forensiki ✓ / diketsahalo tsa
 botlokotsebe / khetholla dinokwane
 Ho batla batho ba lahlehileng ✓
 Khetholla batho ba shweleng ✓/ liphoofolo
 Ho khetholla mathata a diphatsa tsa lefutso ✓
 Disele tse lumellanang bakeng sa ho fetiswa ha setho ✓
 Ho theha dikamano tsa lelapa ✓
Tshwaya tse PEDI feela (Efe kapa efe 2 x 1) (2)
- 2.3 2.3.1 Sebopeho sa sekele(sickle) disele tse khubelu tsa madi di baka tšitiso
 methapong ya madi e lebisang ho senyeheng ha ditho tsa bohlokoa
 ✓/ tsamayisa oksijene e nyane e lebisang ho eneji e nyane / anaemia (1)
- 2.3.2 Stem cell ke disele tse sa khethollweng ✓ tse nang le monyetla wa ho
 theha disele kapa setho ✓sefe kapa sefe (2)

- 2.3.3 (a) CUU ✓ (1)
 (b) Glycine ✓ (1)
 (c) Haeba Thymine e fetoha Adenine
 - mRNA / codon e tla ba GUG ✓ sebakeng sa GAG
 - tRNA / anticodon e tla ba CAC ✓ sebakeng sa CUC
 - Ka hona, amino acid e tla ba Valine ✓
 - sebakeng sa Glutamine ✓ (4)

2.3.4

P₁	Phenotype	Tona e tlwaelehileng	x	Motho e motshehadi ya tlwaelehileng ✓
	Genotype	HH ✓	x	Hh ✓
Meiosis				
	G/gametes	H, H	x	H, h ✓
Fertilisation				
F₁	Genotype	HH ; HH ; Hh ; Hh ✓		
	Phenotype	Tsohle tse Tlwaelehileng		

Ba na le **0%** ✓* monyetla wa ho ban a lefu la

P₁ and F₁ ✓

Meiosis and fertilisation ✓

efe kapa efe 5 + *1 e ya o tlama

KAPA

P₁	Phenotype	Tona e tlwaelehileng	x	Motho e motshehadi ya tlwaelehileng ✓												
	Genotype	HH ✓	x	Hh ✓												
Meiosis																
	G/gametes	H , H	x	H , h ✓												
Fertilisation F₁		<table border="1"><tr><td>Gametes</td><td>H</td><td>h</td></tr><tr><td>H</td><td>HH</td><td>Hh</td></tr><tr><td>H</td><td>HH</td><td>Hh</td></tr><tr><td colspan="3">Correct genotypes ✓</td></tr></table>			Gametes	H	h	H	HH	Hh	H	HH	Hh	Correct genotypes ✓		
Gametes	H	h														
H	HH	Hh														
H	HH	Hh														
Correct genotypes ✓																
	Phenotype	Tsohle tse Tlwaelehileng														
Ba na le 0% ✓ * monyetla wa ho ban a lefu la																
P ₁ and F ₁ ✓ Meiosis and fertilisation✓ *1 e ya o tlama + efe kapa efe 5																

(6)

- 2.4 2.4.1 Karyogram ✓ / Karyotype (1)
- 2.4.2 - Dichromosome pair 23 ✓ ho na le
- dichromosome tse pedi X ✓/ XX / dichromosome di lekana ka boholo (2)
- 2.4.3 - Hobane ho na le dihlopha tse medi tsa dichromosome ✓/ 46 dichromosomes / ke dipalo tsa diploid / homologous
- eseng sehlopha se le seng sa dichromosome ✓ / eseng dichromosome tse 23 / eseng haploid (2)
- 2.4.4 Down's Syndrome ✓/ trisomy 21 (1)
- 2.4.5 - Dihomologous chromosome tsa bo-21 ✓
- o seke wa arola ✓ / non-disjunction
- Sena se tla lebisa ho gamete e le ngwe e nang le dikopi tse pedi tsa dichromosome 21 ✓
- Ha gamete ena e kopana le gamete ✓ e tlwaelehileng
- zygote e hlahiswang e tla ba le kopi e eketsehileng ya chromosome dikopi tse 21✓ / 3 tsa chromosome 2
(Efe kapa efe tse 3 x 1) (3)
- 2.5 2.5.1 Dihybrid ✓ Cross (1)
- 2.5.2 Ho na le ditshobotsi tse pedi tse fapaneng ✓ – ho croswa (1)
- 2.5.3 (a) bbtt ✓✓ (2)
- (b) Ka bobedi e Ntšo ebile ha ho na di patches tse tshweu ✓✓
KAPA
Motswadi 1 – O motsho ebile ha ho na ditshwantsho tse tshweu ✓
Motswadi 2 – O motsho ebile ha ho na ditshwantsho tse tshweu ✓ (2)
- 2.5.4 - Kaha jase e ntsho e laolwa ke allele ✓ e ka sehloohong
- katsana e ka ba homozygous / BBtt kapa heterozygous ✓/ Bbtt (2)
- 2.5.5 - Di alleles tse pedi tse mabapi le di homologous chromosomes di arohane ✓
- nakong ya sebopeho sa meiosis ✓ / anaphase / gamete, e le hore
- ho na le allele e le ngwe feela ya para ka ngwe e teng ho gamete ✓
/ bana o ka fumana mokhelo o le mong ho motswadi ka mong (3)

[50]

POTSO 3

- 3.1 3.1.1 (Kerafo e bontsha) palo ya dihlopha tsa monarch butterfly ho tloha 1994 ho fehlela 2010 ✓ (1)
- 3.1.2 (a) Tshebediso ya sebolayalehola (herbicides) ✓ (1)
(b) Palo ya dihlopha tsa monarch butterflies ✓ (1)
- 3.1.3 - Palo ya monarch butterfly colonies e fokotsehile ho tloha ka 1996 ✓
- pele dibolaya lehola di sebediswa ka 1998. ✓ (2)
- 3.1.4 - Selo seo DNA / genome ya sona e fetotsweng(modified) ✓
- ho hlahisa tshobotsi e lakatsehang ✓ (2)
- 3.1.5 - Tlhodisano e nyane ya dijalo le lehola ✓ / ho tla ba le yield e ngata
- ho lebisang keketsehang ya phaello ya dihwai (farmers) ✓ (1)
- 3.2 3.2.1 Ho ne ho se na dijo tse lekaneng hore ba ka di ja ✓ (1)
- 3.2.2 - Mekholutswane a ne a arotswe ke metsi ✓
- mme ka hona, ho ne ho se na ho nyallana ✓ (2)
- 3.2.3 - Sehlekehlekeng sena ho na le phapang ka boholo ba *Gymnodactylus amarali* ✓ / mekhodutswane
- Mekholutswane e meng e ne e na le dihlooho tse nyane ha tse ding di ne di na le dihlooho tse kholoanyane ✓
- Ha ho ne ho na le bohlwa (termites) bo bongata dihlekehlekeng ✓
- Tse nang le dihlooho tse nyane di shwele ✓hobane ba ne ba ka ja feela bohlwa(termites) bo bonyenyane
- Tse nang le dihlooho tse kholo ba pholohile✓ba ne ba ka ja bohlwa bo boholo ba ile ba ikatisa mme ba fetisa semelo sa bona sa dihlooho tse kholo bana ba bona ✓
- Qetellong ha nako e ntse e feta ho ile ha ba le karolo e kholo ya mekhodutswane ledihlooho tse kholoanyane ✓
(Efe kapa efe 5 x 1) (5)
- 3.2.4 - Haeba mefuta ya dihlekehleke e ka kopana le mefuta ya naha ✓
- me ba hlahisa peo e nonneng (fertile) ke mofuta o tshwanang ✓ / haeba ba etsa jwalo
- ha e hlahise bana ba nonneng (fertile), ha se mofuta o tshwanang (2)

3.3 3.3.1 *Homo sapiens* ✓ (1)

3.3.2 - ho kgona ho lla ✓ / loma / hlafuna
- lijo tse tala raw (2)

3.3.3 Tabole ✓

Batho	Korilla
1. Cranium e kholo ✓/boko	1. Cranium e nyane ✓/boko
2. Sefahleho se sephara✓/ Moepa wa phatla o tlase Ho ya morao	2. Sefahleho se sekameng✓ / Phatla matswapong haholo Ka morao
3. Maporogo a phatla a manyane e phatlalalitswe phatlalatsa ✓	3. Metse e meholo e mengata phatlalatsa✓
4. Mahlahare a nyane haholo ✓ (less protruding jaws) / Prognathous	4. Mahlahare e hlahella haholwanyane jaws ✓ / prognathous
5. Mohlahare o tlase o na le sediba-ntshetswa pele chin ✓	5. Mohlahare o tlase ha o na hantle ntshetswa pele chin ✓

(Tshwaya tsa pele tse THARO fela) Tabole + (Efe le efe 3 x 2) (7)

3.3.4 - Lesela/thumb) le hanyetswang ✓
- Matsoho a potolohang ka bolokolohi ✓
- Manonyeletso a litsweng a lumella ho potoloha ha forearm ✓
- Potoloha matsoho bonyane 180 ° ✓
- (Flat) manala ho fapana le manala ✓ / menwana e hlobotseng
- Dinomoro tse hlano / pentadacty ✓

(Tshwaya tsa pele tse PEDI fela)

(efe kapa efe 2 x 1) (2)

3.4 3.4.1 - Australopithecus✓
- Ardipithecus ✓ (2)

3.4.2 4 ✓ mya (1)

3.4.3 $(4,5 - 1) = 3,5$ ✓✓ my (2)

- 3.4.4 - Foramen magnum e se e fihlile botlaaseng ba lehata ✓ / e se e le pele haholo e le hore hlooho e ka tshwarwa e eme hantle. ✓
Cord / boko o lesapong la mokokotlo (spinal cord) le ka tsamayellana le boko (brain) / mokokotlo ho kenella lehata ka lehlakoreng le leng
- Boemo ba senyepa sa pelvic bo sutumelletse tlase ✓ / tlase meleng wa mmele wa mmele ✓ kahoo ho loketse ho jara boima ba holimo mmele ✓
- The noka e se e bōpehileng jwaloka kopi / sephara le e khutswanyane ✓ e leng etsa hore ho loketse ho jara bokong / boima ba 'mele wa ka holimo ✓ / bakeng sa kabo e molemo ya boima ba mele e ka holimo
- Mokokotlo o ile wa fetoha sebopeho sa S ✓ / kholo e kholo ya mapolanka mokokotlong bakeng sa ho leka-lekanya hantle / ho tshehetsa boima ba mele bo holimo
- Tshwaya tsa pele tse PEDI fela** (Efe le e fe 2 x 2) (4)

- 3.4.5 (a) *Australopithecus africanus* ✓ (1)
(b) Sterkfontein ✓ Caves (1)
(c) Robert Broom ✓ / John T Robinson (1)

- 3.5 3.5.1 Batho ba sejwale-jwale ba simolohile Afrika ✓ ebe ba fallela dikhonthinenteng tse ding ✓ (2)

- 3.5.2 Fossil evidence ✓
mitochondrial DNA ✓ / mtDNA
Tshwaya tse PEDI feela (2)

- 3.5.3 Americas ✓ (1)

- 3.5.4 (200 000 – 45 000) ✓ years = 155 000 ✓ years (2)

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KAKARETSO YA KAROLO B: 100
KAKARETSO YOHLE: 150