



Province of the  
**EASTERN CAPE**  
EDUCATION

Iphondo leMpuma Kapa: Isebe leMfundo  
Provinsie van die Oos Kaap: Departement van Onderwys  
Porafensie Ya Kapa Botjhabela: Lefapha la Thuto

# **NATIONAL SENIOR CERTIFICATE**

## **KEREITI 12**

### **LOETSE 2024**

## **FISIKALE SAENSESE P1 TATAISO YA HO TSWAYA**

**MATSHWAO: 150**

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Tataiso ena ya ho tswaya e na le maqephe a 18 .

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**DITATAISO KA HO PHATLALLA****1. DIKHALEKULEISHENE**

- 1.1 **Dimaraka di fanwa ha:** fomulara e nepahetse, substitution e nepahetse, Karabo ya yuniti e nepahetse.
- 1.2 **Ha ho dimaraka** tse tla fanwa ha **fomulara e nepahetseng kapa fomulara e sebedisitsweng ka nepo**, leha hona le disimpole tse ngata tse ka kenellang hantle.
- 1.3 Ha phoso e etswa ha **ho kenyeletswa fomulareng e nepahetseng**, le moo ho kenyeletsang, **ha hona fanwa ka dimaraka ho ya pele**.
- 1.4 **Ha fomulara e sa fanwa**, empa **dikenyeletso di nepahetse**, but **all substitutions are correct**, ngwana ya balang **ha ana ho fuwa maraka**.
- 1.5 **Ha ho na tingwa ngwana dimaraka ha dikekyeletso di siuwe moo khaltjhuleishene di nepahetseng/porinsipole e nepahetseng**.
- 1.6 Dimathemathikhale manipohuleishense le phetoho ya change of subject ya difomulara tse nepahetseng ha enke dimaraka, empa ha ngwa ya kolang a qala ka nfomulara e nepahetseng mme fetola subject of the formula hampe, dimaraka di tla fanwa bakeng sa fomulara le dikenyeletso tse nepahetseng. Maraka ya lenane le fosahetseng ha ena ho fanwa.
- 1.7 Dimaraka di tla ajwa fela fomularang **ha khaltjhuleishene e entswe**, jwalo ka, dikenyeletso di entswe kapa manane a karabo a fanwe.
- 1.8 Dimaraka di tla fanwa feela ha dikenyeletso tsa manane di kenyeleditswe fomulareng mme di sa thathamiswa pela khaltjhuleishene.

- 1.9 Dikhaltjhuleishene kaofela, ha disa sepesifauwa potsong, di tlameha ho etswa ho detesimale tse pedi.
- 1.10 Ha karabo ya ho qetela ya khaltjhuleishene e nepahetse, di maraca tse fleets ha di na fanwa the feela. Batswayi kamehla bat la etsa bonnete bah ore fomulara e nepahetseng/e tswanelehileng e ya sebediswa mme mesebetsi, le dikenyeletso, di nepahetse.
- 1.11 Dipotso moo letoto la khaltjhuleishene di etswang(moghlala, potso ya sekete teyakeramo) ha ho hlokahale kamehla e latele tatatello. DIMARAKA TSE FELETSENG di tla fanwa ha karabo e nepahetse ho latela bothata. Empa, khalkhjuleishene e nngwe fela e kekeng ya tlisa ngwana ngolang haufi le karabo ho feta data ya mathomo, ha ho palo ya dimaraka e tla fanwa..

## 2. DIYUNITI

- 2.1 Ngwana ngolang u tla tingwa hangwwe fela maraka ha phitile phoso ya tshebediso ya yuniti **kahara potso**.
- 2.2 Diyuniti di hlokahala feela karabong ya ho qetela ya khaltjhuleishene..
- 2.3 Dimaraka di fanwa ha feela Karabo, e seng bakeng sa yuniti, eseng yuniti ho tjho fela. Bana ba ngolang hlahlobo batla tingwa maraka e fanwang karabong ye nngwe le e nngwe ya maema a latelang:
- Karabo e nepahetseng + ho fosahetse yuniti
  - Karabo e fosahetseng + yuniti e nepahetseng
  - Karabo e nepahetseng + yunit e siyo
  -
- 2.4 Diyuniti tsa SI di tlameha ho sebediswa ntle ho maemong a itsen, mohlala.  $V \cdot m^{-1}$  ho na le  $N \cdot C^{-1}$ , le  $cm \cdot s^{-1}$  kapa  $km \cdot h^{-1}$  ho na le  $m \cdot s^{-1}$  moo potso e hlokanang jwalo.

### 3. KA HO PHATLALLA

- 3.1 Ha Karabo kapa khaltjhuleishene e hlokahala, empa Karabo tse pedi di fanwe ke ngwana ya ngolang, Karabo ya pele fela ke yona e tla tswauwa, ho sa tsotellehe hore e nepahetse. Ha eba karabo tse pedi di hlokahala, karabo tse pedi feela tse qalang di tla tswauwa jwalo jwalo.
- 3.2 Bakeng sa ho tswaya, disimpole tsekgetholohileng(s, u, t, etc.) di tla amoheleya.
- 3.3 Kompounte e arohanengya diyuniti tsa malethiupolekijeishene dote, mohlala,  $m \cdot s^{-1}$ . Bakeng sa ho tswaya,  $m \cdot s^{-1}$  le m/s di tla amoheleya.

### 4. HO TSWAYA HO POSETIFO

Motswao o Positifo ho latela dikhaltjhuleishene di tla latelwa maamong ana:

- 4.1 **Potswana le potswana:** Ha fariabole e khaltjhuleituwe potsong (mohlala 3.1) e hloka ho kenyeletswa ho potswana (3.2 ya 3.3), **dimaraka tse feletseng** di fanwa bakeng sa potswana e latelang.
- 4.2 **Potso e nang le dipotswana tse ngata:** Ha ngwana ya ngolang a khaltjhulata, mohlala, karente setep;eng sa pele mme a thola karabo e fosahetseng ka lebaka la kenyeletso e fosahetseng, maraka ya kenyeletso le ya ho qetela u tla tingwa dimaraka.

### 5. HO TSHWAYA HO NEKETIFO

Maamong a tlwaeleileng karabo e fosahetseng ha ena ho nepahala ha e latela phoso ya konsepote. Ha ngwana ya ngolang a hlokwa ho fana ka tshehetso POTSONG ya 3.2 karabo e fanweng POTSONG YA 3.1 e fosahetse, ha ho dimaraka tse tla fanwa ho POTSO YA 3.2. Leha ho le jwalo, ha karabo mohlala, ya POTSO YA 3.1 e amana ka khaltjhuleishene, tshehetso ya karabo e fosahetseng e ka shejwa ka ihlo le leng.

**POTSO YA 1:****DIPOTSO TSA KGETHO**

1.1	B ✓✓	(2)
1.2	C ✓✓	(2)
1.3	C ✓✓	(2)
1.4	A ✓✓	(2)
1.5	B ✓✓	(2)
1.6	A ✓✓	(2)
1.7	D ✓✓	(2)
1.8	D ✓✓	(2)
1.9	B ✓✓	(2)
1.10	A ✓✓	(2)
		<b>[20]</b>

**POTSO YA 2**

- 2.1 Ha nete fose e etsahala nthong, ntho e tla akeselerata lehlakoreng la nete fose ka akeselereishene e amanang ka kotloloho le fose hape e sa amamngeng ka kotloloho le boima ba ntho. ✓✓

**KAPA**

Nete fose/resaletente fose e etsahalang ho ntho e lekana le nako eo momentamo u fetofetohang ka ona. ✓✓

(2)

## 2.2

**Labele tse amohelhang**

<b>w</b>	$F_g/F_w$ /weyiti/kerafitheishinale fose	✓
<b>T</b>	$F_T$ /Thensene/Fosee e khwngeleng	✓
<b>N</b>	$F_N/N$ /Nomale Fose	✓
<b>F<sub>k</sub></b>	$f_k$ /Fose e mahwashe force	✓

(4)

2.3.1  $f_k = \mu_k N$  ✓

$$f_k = \mu_k F_g$$

$$f_k = (0,25)(4)(9,8) \quad \checkmark$$

$$f_k = 9,8 \text{ N} \quad \checkmark$$

(3)

2.3.2 **KGETHO YA 1**

$$F_{\text{net}} = ma$$

$$F_{\text{net}} = T - f$$

$$F_{\text{net}} = F_g - T$$

E nngwe ✓

**Boloko ba 4 kg**

$$T - 9,8 \checkmark = 4a$$

$$T = 4a + 9,8$$

**Boloko ba 2 kg**

$$(2)(9,8) - T \checkmark = 2a$$

$$T = 19,6 - 2a$$

$$19,6 - 2a = 4a + 9,8$$

$$a = 1,63 \text{ m} \cdot \text{s}^{-2}$$

$$v_f^2 = v_i^2 + 2a\Delta y \checkmark$$

$$v_f^2 = 0^2 + 2(1,63)(1) \checkmark$$

$$v_f = 1,81 \text{ m} \cdot \text{s}^{-1} \checkmark$$

E nngwe(4a kapa / 2a) ✓

(7)

- 2.4 Kerafitheishenale fose (weyiti) ha se yona fela e etsahalang ho 2 kg boloko. ✓✓

**KAPA**Akeselereishene ha se  $9,8 \text{ m} \cdot \text{s}^{-2}$ . ✓✓

(2)

**[18]**

**POTSO YA 3**3.1 *Tlase* ✓

(1)

3.2

<b>Hodimo ke positifo</b>	<b>Tlase ke posetifo</b>
$v_f = v_i + a \Delta t$ ✓ $= 30 \checkmark + (-9,8)(2,135)$ $= 9,08 \text{ m} \cdot \text{s}^{-1}, \text{ hodimo } \checkmark$	$v_f = v_i + a \Delta t$ ✓ $= -30 \checkmark + (9,8)(2,135)$ $= -9,078 \text{ m} \cdot \text{s}^{-1}$ $= 9,08 \text{ m} \cdot \text{s}^{-1}, \text{ hodimo } \checkmark$

(3)

3.3

**KGETHO YA 1**

<b>Hodimo ke positifo</b>	<b>Tlase ke posetifo</b>
<b>Bolo ya A:</b> $\Delta y = v_i \Delta t + \frac{1}{2} a \Delta t^2$ ✓ $\Delta y = -12(2,5) + \frac{1}{2}(-9,8)(2,5)^2$ ✓ $\Delta y = -60,625 \text{ m}$ (Bophahamo = 29,375 m) <b>Bolo ya B:</b> $\Delta y = v_i \Delta t + \frac{1}{2} a \Delta t^2$ $= \frac{30(2,5)}{+ \frac{1}{2}(-9,8)(2,5)^2}$ ✓ $= 44,375 \text{ m}$ Sebaka = $44,375 - 29,375$ ✓ $= 15 \text{ m } \checkmark$	<b>Bolo ya A:</b> $\Delta y = v_i \Delta t + \frac{1}{2} a \Delta t^2$ ✓ $\Delta y = \frac{12(2,5)}{+ \frac{1}{2}(9,8)(2,5)^2}$ ✓ $\Delta y = 60,625 \text{ m}$ (Bophahamo = 29,375 m) <b>Bolo ya B:</b> $\Delta y = v_i \Delta t + \frac{1}{2} a \Delta t^2$ $= \frac{-30(2,5)}{+ \frac{1}{2}(9,8)(2,5)^2}$ ✓ $= -44,375 \text{ m}$ Sebaka = $44,375 - 29,375$ ✓ $= 15 \text{ m } \checkmark$

..

**KGETHO YA 1****Bolo ya A**

$$v_f = v_i + a \Delta t$$

$$v_f = -12 + (-9,8)(2,135)$$

$$v_f = 32,923 \text{ m} \cdot \text{s}^{-1}, \text{ tlase}$$

$$\Delta y = v_i \Delta t + \frac{1}{2} a \Delta t^2 \checkmark$$

$$\Delta y = \frac{-32(2,5-2,135)}{+ \frac{1}{2}(-9,8)(2,5-2,135)^2} \checkmark$$

$$\Delta y = -12,6696 \text{ m}$$

**Bolo ya B**

$$\Delta y = v_i \Delta t + \frac{1}{2} a \Delta t^2$$

$$\Delta y = \frac{9,08(2,5 - 2,135)}{+ \frac{1}{2}(-9,8)(2,5 - 2,135)^2} \checkmark$$

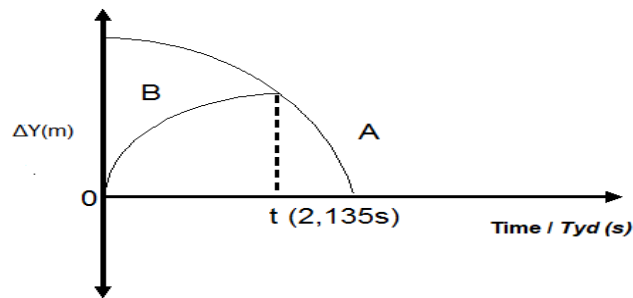
$$\Delta y = 2,66 \text{ m}$$

$$\text{Sebaka} = 2,66 + 12,6696 \checkmark$$

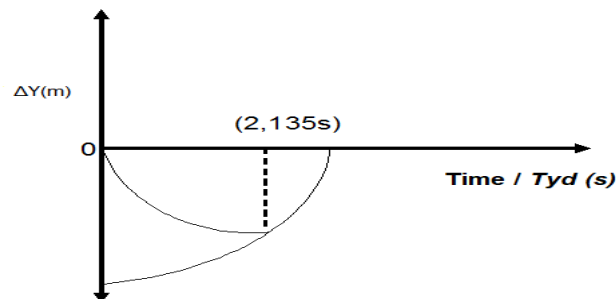
$$15,33 \text{ m } \checkmark$$



3.4 **KGETHO YA 1**  
Hodimo ke positifo



**KGETHO YA 2**  
Tlase ke posetifo



<i>Mokhwa wa ho tshwaya kerafo</i>	<b><i>Dimaraka</i></b>
Sebopeho a bolo ya <b>A</b> ho zero position.	✓
Sebopeho sa bolo ya <b>B</b> ho ya hodimo ho fihlela dilaene diteyana le nako. 2,135 s/	✓
Nako ya 2,135 s e bontshitswe	✓
Fatshe ha se zero position (Ha ntho e nngwe le e nngwe e nepahetse): $\frac{2}{3}$	

(3)  
[12]

**POTSO YA 4**

- 4.1 Totale momentamo ✓ o lineya ya aesolated sisitimi ✓ e dula ele konsetente/konsefote.

(2)

- 4.2 **Hlakore le letona ke positifo**

$$\left. \begin{aligned} \Sigma p_i &= \Sigma p_f \\ (mv_i)_1 + (mv_i)_2 &= (mv_f)_1 + (mv_f)_2 \end{aligned} \right\} \text{E nngwe} \checkmark$$

$$(5\,000)(15) + (2\,000)(-20) \checkmark = (5\,000)v_f + (2\,000)(5) \checkmark$$

$$v_i = 5 \text{ m} \cdot \text{s}^{-1} \checkmark$$

**Hlakore le letshehadi ke posetifo**

$$\left. \begin{aligned} \Sigma p_i &= \Sigma p_f \\ (mv_i)_1 + (mv_i)_2 &= (mv_f)_1 + (mv_f)_2 \end{aligned} \right\} \text{E nngwe} \checkmark$$

$$(5\,000)(-15) + (2\,000)(20) \checkmark = (5\,000)v_f + (2\,000)(-5) \checkmark$$

$$v_i = -5 \text{ m} \cdot \text{s}^{-1}$$

$$\text{Makenetjute ya felositi} = 5 \text{ m} \cdot \text{s}^{-1} \checkmark$$

(4)

- 4.3 **KGETHO YA 1**

$$\left. \begin{aligned} F_{\text{net}} \Delta t &= \Delta p \\ F_{\text{net}} \Delta t &= mv_f - mv_i \end{aligned} \right\} \text{E nngwe} \checkmark$$

$$F_{\text{net}} (0,4) \checkmark = (5\,000)(5) - (5\,000)(15) \checkmark$$

$$F_{\text{net}} = -125\,000 \text{ N}$$

$$F_{\text{net}} = \underline{125\,000 \text{ N ho ya ho le letona}} \checkmark$$

**KGETHO YA 2**

$$\left. \begin{aligned} F_{\text{net}} \Delta t &= \Delta p \\ F_{\text{net}} \Delta t &= mv_f - mv_i \end{aligned} \right\} \text{E nngwe} \checkmark$$

$$F_{\text{net}} (0,4) \checkmark = (2\,000)(-5) - (2\,000)(20) \checkmark$$

$$F_{\text{net}} = -125\,000 \text{ N}$$

$$F_{\text{net}} = \underline{125\,000 \text{ N ho ya ho le letona}} \checkmark$$

(4)

**[10]**

**POTSO YA 5**

5.1 Kamora monna ✓ (1)

5.2 Newton's third Law ✓ of motion  
Ha ntho e phusha fose ho ntho ya bobedi, ntho ya bobedi e phusha ka fose e lekanang ka makenetjute ✓ empa e ya kgahlanong malebana le ntho ya pele. ✓ (3)

5.3 **KGETHO 1**

$$\left. \begin{aligned} W_{\text{net}} &= \Delta K \\ W_g + W_f &= \Delta K \end{aligned} \right\} \text{E nngwe} \checkmark$$

$$F_g \Delta x \cos \Theta + f \Delta x \cos \Theta = \Delta K$$

$$(57)(9,8)(4) \cos 180^\circ \checkmark + 40 \Delta x \cos 180^\circ \checkmark = \underline{0 - \frac{1}{2}(57)(6^2)} \checkmark$$

$$\Delta x = -30,21 \text{ m}$$

$$\sin \Theta = \frac{4}{30,21}$$

$$\Theta = 7,61^\circ \checkmark$$

**KGETHO YA 2**

$$W_{\text{nc}} = \Delta U + \Delta K / W_{\text{nc}} = \Delta E_p + \Delta E_k \checkmark$$

$$40 \Delta x \cos 180^\circ \checkmark = \underline{(57)(9,8)(4) - (57)(9,8)(0)} \checkmark + \underline{\frac{1}{2}(57)(0)^2 - \frac{1}{2}(57)(6)^2} \checkmark$$

$$\Delta x = -30,21 \text{ m}$$

$$\sin \Theta = \frac{4}{30,21}$$

$$\Theta = 7,61^\circ \checkmark$$

(5)

5.4 **KGETHO YA 1**

$$\left. \begin{aligned} W_{\text{net}} &= \Delta K \\ W_T + W_g + W_f &= \Delta K \end{aligned} \right\} \text{E nngwe} \checkmark$$

$$(80)(5)(4) \cos 0^\circ \checkmark + \underline{(4)(9,8) \sin 30^\circ \cdot (5) \cos 180^\circ} \checkmark + (15)(5) \cos 180^\circ \checkmark$$

$$= \frac{1}{2}(4)v_f^2 - \frac{1}{2}(4)(3^2) \checkmark$$

$$v_f = 11,07 \text{ m} \cdot \text{s}^{-1} \checkmark$$

**KGETHO YA 2**

$$\left. \begin{aligned} W_{\text{nc}} &= \Delta U + \Delta K \\ W_T + W_f &= \Delta U + \Delta K \end{aligned} \right\} \text{E nngwe} \checkmark$$

$$(80)(5)(4) \cos 0^\circ \checkmark + (15)(5) \cos 180^\circ \checkmark =$$

$$\underline{(4)(9,8)(\sin 30^\circ)(5) - (4)(9,8)(0)} \checkmark + \underline{\frac{1}{2}(4)v_f^2 - \frac{1}{2}(4)(3)^2} \checkmark$$

$$v_f = 11,07 \text{ m} \cdot \text{s}^{-1} \checkmark$$

(6)  
[15]

## POTSO YA 6

- 6.1 Phetoho(e ka bang teng) ya forekwensi/pitjhi✓ ya(modumo) wa weifo e utluwang ke modumo wa diweifo ha motsamo o bapiswang dipakeng tsa momamedi le sose e etsang modumo ✓

(2)

6.2.1 *E ya eketseha* ✓

(1)

6.2.2 *E ya fokotseha* ✓

(1)

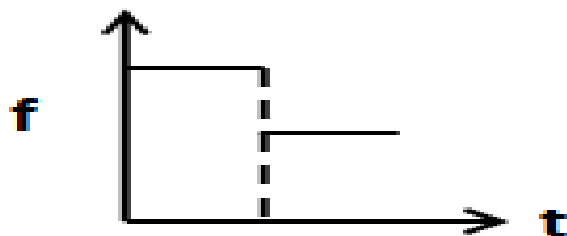
6.3  $f_L = \frac{v \pm v_L}{v \pm v_s} f_s$  ✓ or  $f_L = \frac{v + v_L}{v} f_s$  ✓

$$f_L = \frac{330 + 30}{330 - 0} \times 1\,800$$

$$f_L = 1\,963,6 \text{ Hz}$$

(5)

6.4

**Ma**

Dilabole tsa akesese

✓

Forekwensi e hodimo qalong

✓

Forekwensi e tlase ya nako e eketsehang

✓

(3)

- 6.5 Bloodflow meter ✓ / Doppler flow meter ✓/

(1)

**[13]**

**POTSO YA 7**

- 7.1 Fose e hwehwehang kapa e phushang dipakeng tsa dithjathjhe tse pedi e amana ka kotloloho le tlhaiso ya makenetjute ya dithjathjhe✓ hape e ha e amane ka kotloloho le sebaka se dipakeng tsa stona.✓

(2)

7.2 Ka ha  $F_{K \text{ on } M} = F_{G \text{ on } M} \checkmark$   
 $(F_{\text{net}})^2 = (F_{K \text{ on } M})^2 + (F_{G \text{ on } M})^2 \checkmark$   
 $(2,864 \times 10^{-6})^2 \checkmark = F^2 + F^2$   
 $F = 2,025 \times 10^{-6} \text{ N} \checkmark$

(4)

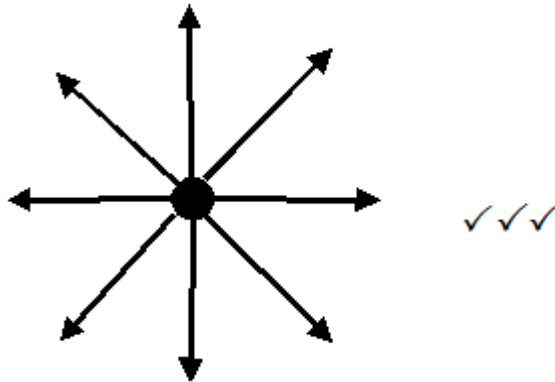
7.3  $F = \frac{kQ_1Q_2}{r^2} \checkmark$   
 $2,025 \times 10^{-6} \checkmark = \frac{9 \times 10^9 \times 6 \times 10^{-9} \times 6 \times 10^{-9}}{(X)^2} \checkmark$   
 $X = 0,4 \text{ m} \checkmark$

(4)

**[10]**

## POTSO YA 8

8.1



(3)

<b>Mokhwa wa ho tswaya</b>	
Sebopeho se nepahetseng	✓
Lehlakore le nepahetseng	✓
Dilaene tse thetsanang le tse fapanyetsanang	✓

8.2 Eleketerostatikese fose e etswang per unit posetifo tihatje e beuweng ntlheng. ✓✓

(2)

8.3  $E_P = \frac{kQ_1}{r^2}$  ✓

$$E_P = \frac{9 \times 10^9 \times 200 \times 10^{-9}}{(0,2)^2} \quad \checkmark$$

$$E_P = 45\,000 \text{ N.C}^{-1} \text{ ho ya ho le letona}$$

$$E_Q = \frac{kQ_2}{r^2}$$

$$E_Q = \frac{9 \times 10^9 \times 200 \times 10^{-9}}{(0,4)^2} \quad \checkmark$$

$$E_Q = 11\,250 \text{ N.C}^{-1} \text{ ho ya ho le le tshehadi}$$

$$E_{\text{net}} = 45\,000 + (-11\,250) \quad \checkmark$$

$$E_{\text{net}} = 33\,750 \text{ N.C}^{-1} \text{ ho ya ho leletona} \quad \checkmark$$

(5)  
[10]

**POTSO YA 9**

9.1 Ho netefatsa motsamao o potapotang wa khwele. ✓ (1)

9.2 (i) Repoleisa sose ya potenshiale diforensa ka load/resisetara. ✓

(ii) Repolaisa sepoliti reng (commutator) ka (tse pedi) selipo reng ✓ (2)

9.3 
$$I_{\text{rms}} = \frac{I_{\text{max}}}{\sqrt{2}} \quad \checkmark$$

$$I_{\text{rms}} = \frac{0,54}{\sqrt{2}} \quad \checkmark$$

$$I_{\text{rms}} = 0,38 \text{ A}$$

$$P_{\text{ave}} = V_{\text{rms}} I_{\text{rms}} \quad \checkmark$$

$$60 = V_{\text{rms}} \times 0,38 \quad \checkmark$$

$$V_{\text{rms}} = 157,89 \text{ V} \quad \checkmark$$

(5)  
**[8]**

**POTSO YA 10**

- 10.1 Potensheale diforens e amana ka kotloloho le karente, ✓ ha motjheso u sa fetohe. ✓

**KAPA**

Reshio ya potensheale diforens ho karente ha motjheso u sa fetohe. ✓

(2)

- 10.2

<b><u>KGETHO YA 1</u></b>	<b><u>KGETHO YA 2</u></b>
$P = \frac{V^2}{R} \checkmark$ $13,5 = \frac{(18)^2}{R} \checkmark$ $R = 24 \Omega \checkmark$	$P = VI \checkmark$ $I_R = P/V = 13,5/18 \checkmark = 0,75 \text{ A}$ $V = IR$ $R = V/I_R = 18/0,75 = 24 \Omega \checkmark$

(3)

- 10.3

<b><u>KGETHO YA 1</u></b>	<b><u>KGETHO YA 2</u></b>
$R = \frac{V}{I} \checkmark$ $24 = (18) \checkmark$ $I = \frac{V}{R} \checkmark$ $I = \frac{18}{24} \checkmark$ $I = 0,75 \text{ A}$ $R = \frac{V_p}{I_{12}}$ $12 = \frac{18}{I_{12}}$ $I_{12} = 1,5 \text{ A} \checkmark$ $I_{\text{Total}} = 1,5 + 0,75 = 2,25 \text{ A} \checkmark$	$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} \checkmark$ $\frac{1}{R_p} = \frac{1}{12} + \frac{1}{24} \checkmark$ $R_p = 8 \Omega \checkmark$ $V = IR_p$ $18 = I(8) \checkmark$ $I = 2,25 \text{ A} \checkmark$

(5)

- 10.4 Resisetense ya kahare e kgahlanong le ho phalla ha tijaetjhe kahara betiri. ✓✓

(2)

- 10.5  $V_{10} = IR_{10} \checkmark$   
 $V_{10} = 2,25 \times 10 \checkmark$   
 $V_{10} = 22,5 \text{ V} \checkmark$

(3)



## 10.6 KGETHO1

$$V_1 = V_{\text{ext}}$$

$$V_1 = V_P + V_{10}$$

$$V_1 = 18 + 22,5 \checkmark$$

$$V_1 = 40,5 \text{ V}$$

Ha switjhi e butswe  $\text{Emf} = 45,9 \text{ V}$

$$\begin{aligned} \text{Folete tse lahlehileng 'lost volts' ke: } V_{\text{lost}} &= \text{emf} - V_{\text{ext}} \\ &= 45,9 - 40,5 \checkmark = 5,4 \text{ V} \end{aligned}$$

$$r = \frac{V_L}{I} \checkmark$$

$$r = \frac{5,4}{2,25} \checkmark$$

$$r = 2,4 \Omega \checkmark$$

## KGETHO YA 2

$$\text{Emf} = I (R + r) \checkmark$$

$$45,9 \checkmark = (2,25) (8 + 10 + r) \checkmark$$

$$r = 2,4 \Omega \checkmark$$

$$\begin{aligned} \frac{1}{R_p} &= \frac{1}{r_1} + \frac{1}{r_2} \\ \frac{1}{R_p} &= \frac{1}{12} + \frac{1}{24} \checkmark \\ R_p &= 8 \Omega \end{aligned}$$

(5)

## 10.7 E ya eketseha

(1)

**[21]**

**POTSO YA 11**

11.1  $c = f \times \lambda$  ✓

**Amohela**  $v = f \lambda$

$3 \times 10^8 = f \times 229 \times 10^{-9}$  ✓

$f = 1,31 \times 10^{15} \text{ Hz}$  ✓ (3)

11.2 Threshold forekwensi ✓ (1)

11.3 Work function ya boleng bo bonyanyanyanyana ba eneji bo hlokahala ho ntsha eleketerone safeise e thata e fanweng, hangata ke tshepe. ✓✓ (2)

11.4  $E = W_o + E_{k(\max)}$  ✓

$hf = W_o + \frac{1}{2} mv^2$

$6,63 \times 10^{-34} \times f$  ✓ =  $(6,63 \times 10^{-34} \times 1,31 \times 10^{15}) + \frac{1}{2} (9,11 \times 10^{-31}) (1,57 \times 10^6)^2$  ✓

$f = 3 \times 10^{15} \text{ Hz}$  ✓ (4)

11.5 E YA EKETSEHA ✓

Ho fokotseha ha weifolenfo ho fana ka sephetho sa ho nyoloha ha forekwensi. ✓  
Work function e ya nyoloha. ✓

**KAPA**

$W_o \propto \frac{1}{\lambda_o}$  ✓

(3)

[13]

**TOTALE: 150**