Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE

KEREITI YA 12

LOETSE 2023

FISIKALE SAENSESE P1

MATSHWAO: **150**

NAKO: **Dihora tse 3**

Pampiri ena e na le maqephe a 19 ho kenyeletsa le didatha shiti tse-3.

MELAO LE TLHAHISO-LESEDING

1. Ngola LEBITSO le FANE tsa hao ka botlalo dibakeng tse nepahetseng BUKENG YA HO ARABELA.

2. Araba dipotso KAOFELA.

3. O ka sebedisa khaltjhuleitha e sa porokerengwang.

4. O ka sebedisa dihlomo tse nepahetseng tsa mathamatikisi.

5. Nomora dikarabo tsa hao ho jwalo ka ha ho nomorilwe ho pampiri ena ya dipotso.

6. O eletswa ho sebedisa DATA SHITI tse kgomareditsweng.

7. Difomulara le dikenyelletso ditlameha ho bontshwa HOHLE dikhaltjhuleisheneng.

8. Fana ka kgothatso le dimanollo ka bokgutswanyane moo ho hlokehang.

9. Qetellong phethela dikarabo tsa hao ka ho di atametsa ho bonyane dinomoro TSE PEDI tsa didesimale.

10. Qala potso KA NNGWE leqepheng le LETJHA.

11. Ditayekeramo kaofela HA DI YA teroyiwa ho latela sekala.

12 Ngola ka makgethe le ka mongolo o hlakileng.

POTSO 1: DIPOTSO TSA KGETHO

Ho fanwe ka dikgetho tse fapaneng e le dikarabo tse ka kgonehang dipotsong tse latelang. Kgetha karabo mme o ngole tlhaku feela (A–D) pela nomoro ya dipotso(1.1 ho ya ho 1.10), BUKENG YA HO ARABELA, mohlala 1.11 E.

1.1 Ke efe E LE NNGWE ho tse latelang eo e leng measure of inertia of a body?

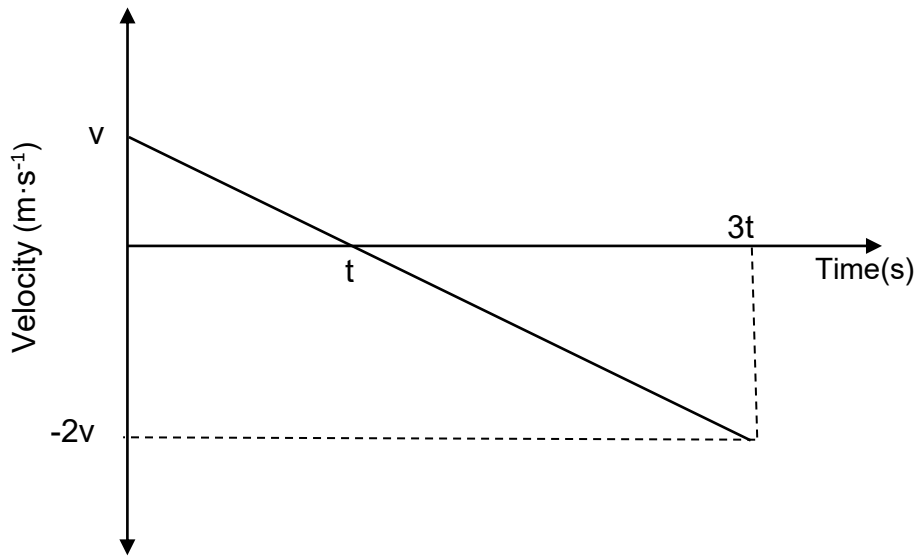
A Ke acceleration

B Ke energy

C Ke velocity

D Ke mass (2)

1.2 Velocity-time kerafo e ka tlase e emetse motsamao wa ntho e tlasa tshusumetso ya gravitational force feela.



Disepoleisemente ya ntho ka 3t ke ...

A vt.

B -vt.

C $\frac{-3}{2}$ vt.

D Zero. (2)

1.3 Di-airbag di ka tshirelletsa mokganni dikotsing ha kotsi e etsahala. Ke efe E LE NNGWE ya metswako e tafoleng ka tlse e hlalosang ka botlalo seo di-airbag di ka se etsang nakong ya ho kopana le net fose e etsahalang ho mokganni nakong ya kotsi, hlalosa hore hobaneng mokganni a tlo tshirelletseha kotsing eo?.

	NAKO YA HO KOPANA	NETE FOSE
A	E a ata	E a ata
B	E a ata	E a fokotseha
C	E a fokotseha	E a ata
D	E a fokotseha	E a fokotseha

(2)

1.4 Ntho e betsetswa hodimo ho tloha fatshe mme e fihla tsullung *h*. Ke EFE ya ditatemente tse latelang e mabapi le motsamao wa ntho ho tloha fatshe ho ya tsullung *h* e nepahetseng?

Se natse kgahlamelo ya forekeshene.

A Mechanical energy ya ntho ho bolelele ba *h* ke zero.

B Phetoho mo kinetic energy ya ntho ke zero.

C The loss in the object's kinetic energy e a lekana le gain in the object's gravitational potential energy.

D Weke e dirilweng on the object e lekana le zero. (2)

1.5 Fose ya gravitational attraction lefatsheng e makgetlo a 6 ho feta ya kgweding. Lebaka la sena ke hore:

A Kgwedi ha e na metsi bokahodimong ba yona.

B Boima le retiase ya lefatshe di kgolo ho feta tsa kgwedi.

C Boima ba lefatshe fela bo boholo ho feta boima ba kgwedi.

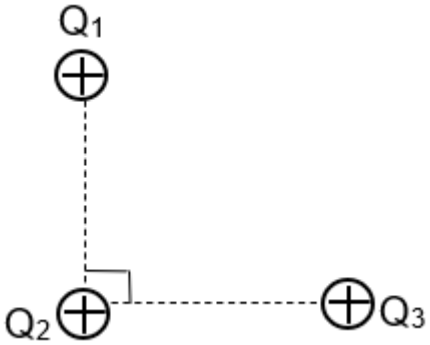
D Fela rediase ya lefatshe e kgolo ho feta rediase ya kgwedi. (2)

1.6 Observer e tsamaya ka lebelo le tshwanang a tloha ho ntho e emeng e etsang modumo, o bona pitjhi ya modumo e ya theoha. Hona ke hobane ho etsahala hore:

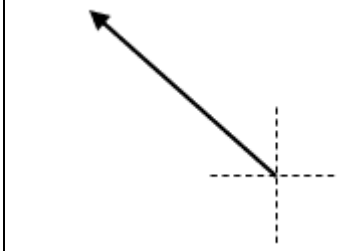
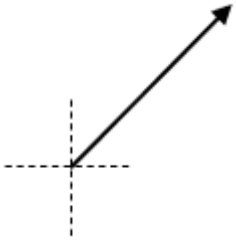
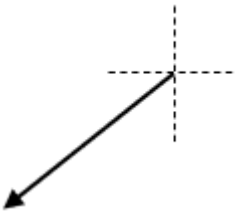
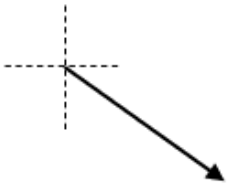
	WAVELENGTH	FOREKWENSI
A	E a ata	E a fokotseha
B	E a fokotseha	E dula e tshwana
C	E a ata	E a ata
D	E a fokotseha	E a ata

(2)

1.7 Dipoente tjhatjhe tse tharo tse posetifo tse tshwanang, Q_1, Q_2 le Q_3, di hlophuwe ka tatellano tayakeramong e bontshitsweng ka tlase.

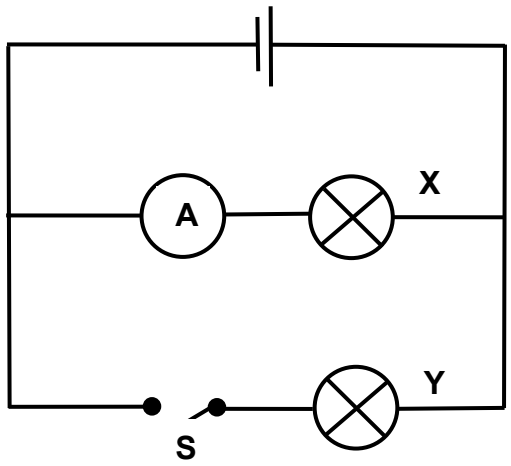


Ke efe E LE NGWE ya tse latelang tetayakeramong e nepahetseng e emelang NETE eleketerosetatiki fose e ekesepirienswang ke tjhatjhe Q_2?

A		B	
C		D	

(2)

1.8 Ho sekete tayakeramo e ka tlase, laete balebo,**X** le **Y** di a tshwana. Switjhi **S** e butswe.



Switjhi **S** e kwetswe jwale.

Ke efe E LE NGWE ya kopano tse ka tlase e hlalosang ka botlalo phetoho ya total resisetense ya sekete le ammeter reading ha switjhi **S** e kwetswe?

	TOTAL RESISTANCE	AMMETER READING
A	E a ata	E a fokotseha
B	E a ata	E dula e tshwana
C	E a fokotseha	E a ata
D	E a fokotseha	E dula e tshwana

(2)

1.9 Lebone le hokahantswe ho AC jenereita, e laeta ka khanya e tshwanang le ha e hokahantswe le DC jenereita e hlahisang potenshiale diforense ya Y volts. Phawara e lahlwang ke lebone ha e hokahantswe ho AC jenereita e lekana le.

A $\frac{Y}{\sqrt{2}}(I_{MAX})$.

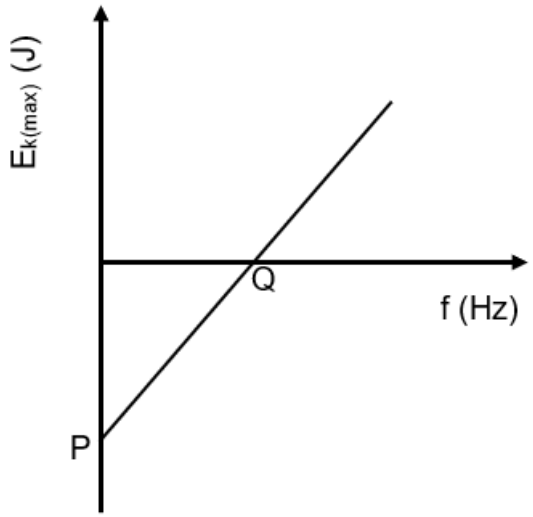
B $\frac{1}{2} I_{max}(Y)$.

C $I_{max}(Y)$.

D $\frac{Y}{\sqrt{2}}(I_{rms})$.

(2)

1.10 Kerafo e ka tlase e bontsha kamano dipakeng tsa sehlohlolong(tsullung) kaenetike eneji ya photo-electrons tse tswang le forekwensi ya incident photon.



Diinthasepte **P** le **Q** kerafong di emetseng?

	INTHASEPOTE P	INTHASEPOTE Q
A	Planck's constant	Threshold forekwensi
B	Threshold forekwensi	Weke fankeshene
C	Weke function	Threshold forekwensi
D	Threshold forekwensi	Planck's constant

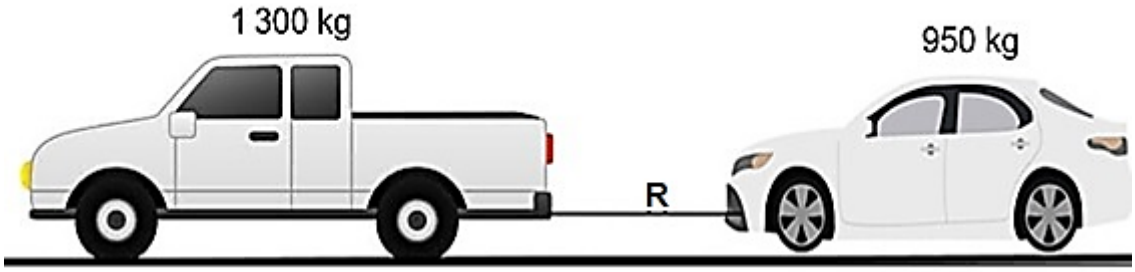
(2)

[20]

POTSO 2

Teraka ya boima ba 1 300 kg e hokahantswe le koloi ya boima ba 950 kg ka ropo e sa sarolloheng, e se nang boima, **R**, e hula koloi tseleng e kgorofo e horisonthale e se nang methinya. Enjene ya teraka e hula ka fose ya 9 000 N ho tsamaisa kopano ya teraka-koloi e yang ho leletshehali jwalo ka ha ho bontshitswe tayakeramong e ka tlase. Teraka e kopana le forekishenale fose e sa fetoheng ya 3 500N. Teraka le koloi di tsamaya ka FELOSITI E SA FETOHENG.

Se natse kgahlamelo ya ho potapota ha mabidi.



2.1 Moithuti o bolela hore ha teraka e tlo ema hang-hang, koloi e tla tswelapele ho tsamaya ka felositi e sa fetoheng.

Ke molao ofe wa fisikisi oo moithuti a o sebedisitseng ho etsa setatement? (1)

2.2 Taka free-body diagram e leibotsweng ya difose tsohle tse etsahalang ho teraka. (5)

2.3 Khaltjhuleitha:

2.3.1 Tenshene e ropong e hokanyang teraka le koloi. (3)

2.3.2 Coefficient ya kinetic friction dipakeng tsa koloi le tsela. (4)

2.4 Ropo e dipakeng tsa teraka le koloi e kgaoha hang-hang jwale koloi e tswelapele ho tsamaya ho ya ho le letshehadi pele e ema.

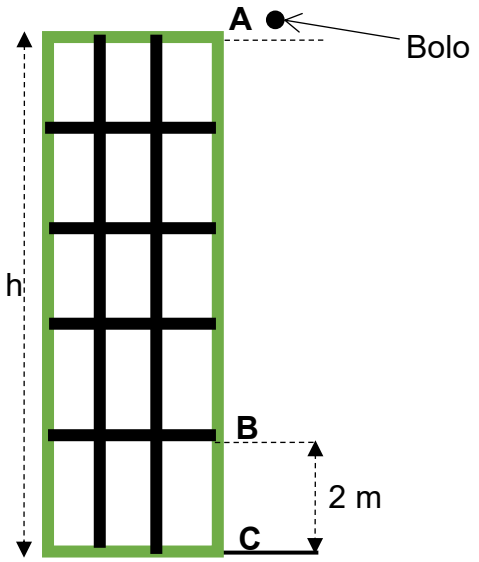
Khaltjhuleitha magnitude ya acceleration ya koloi kamora hore ropo e kgaohe. (3)

[16]

POTSO 3

Lequlwana la baithuti le etsa ekeseperimente ho fumana bolelele *h* ba sekolo sa bona. Ba tlohella bolo ya tenese ho tloha ntlheng ya **A** e qophelleng ya marulelo a moaho wa sekolo jwalo ka ha ho bontshitswe tayakeramong e ka tlase. Ntlha ya **B** e 2 m ka hodima lefatshe, ha bolo e nka 0,125s ho nka sebaka se tlohang ntlheng ya **B** ho ya fatshe(ntlha ya **C)**

Se natse kgahlamelo ya forekeshene ya moya.



3.1 Ngola makenetjhute ya sekgahla sa ho fetoha ha felositi ya bolo. (1)

3.2 Khaltjhuleitha:

3.2.1 Bolelele, *h*, ba moaho wa sekolo (5)

3.2.2 Nako eo bolo e e nkileng ho fihla fatshe (4)

3.2.3 Felositi eo bolo e e nkileng ho otla fatshe (3)

3.3 Sketjha position versus time graph ya motsamao wa bolo nakong ya ha e tloha ho fihlela e otla fatshe. Sebedisa lefatshe e le ntlha ya zero-reference.

Bontsha tse latelang kerafong:

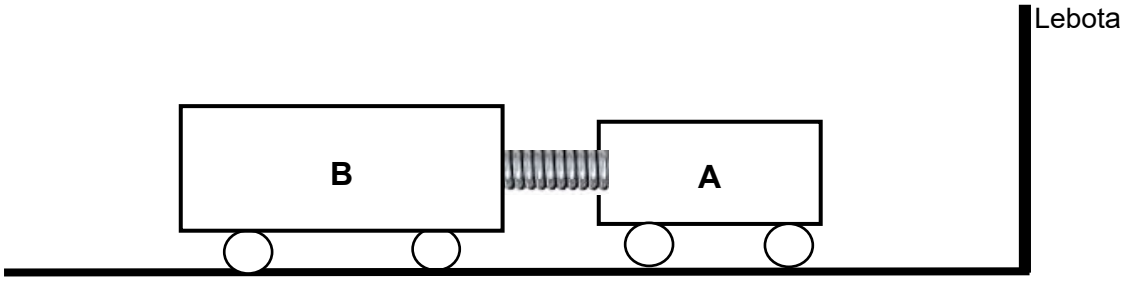
- Height ho tloha moo bolo e tlohetsweng ho yona.
- Nako eo bolo e otlang fatshe (3)

[16]

POTSO 4

Ditorole tse pedi, **A** ya boima ba 1 kg, le **B** ya boima ba 2 kg, di tshwerwe ho se tsamaye tseleng e boreledi e tsitsitseng ka spring se khompresitsweng dipakeng tsa tsona, tayakeramong e ka tlase jwalo ka ha ho bontshitswe. Spring se a tlohelwa ebe se wela fatshe. Torole ya **A** e ya letshohong le letona ka felositi e sa fetoheng ya 5,0 $m.s^{-1}$ mme e thulana le lebota.

Nka eka ke isolated system.



4.1 Hlalosa *isolated system*. (2)

4.2 Khaltjhuleitha felositi ya kariki ya **B** hang kamora hore spring se tlohelwe. (4)

4.3 Afarege fose e etswang ke lebota ho torole ya **A** ke 80 N le thulano ya torole le lebota e nka e 0,5 seconds.

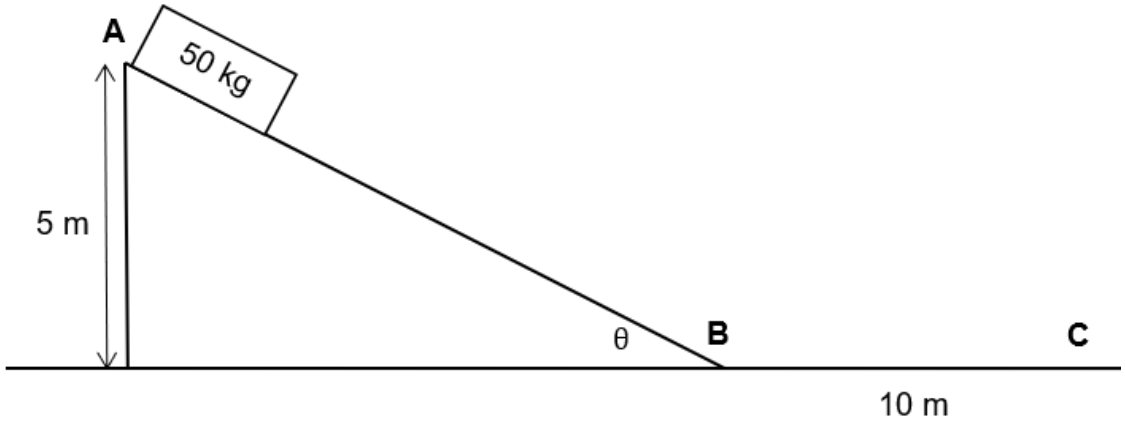
Khaltjhuleitha felositi eo torole ya **A** e tlohang ka yona leboteng. (4)

4.4 Moithuti o hopola hore collision ya torole ya **A** le lebota e inelastic.

Hlalosa ka ho botlalo se bolelwang ka inelastic collision. (2)
[12]

POTSO 5

Kereiti ya mase ya 50 kg e dutse ntlheng ya **A** ya fethikale height ya 5 m ho ya hodimo ho sebaka se horisonthale. Sebaka se nyolosetsang se etsa engele θ le sebaka se motsitseng, jwalo ka ha ho bontshitswe tayakeramong e ka tlase. Ha kereiti e tlohelwa, e thella e ya tlase sebakeng se motheong ho yo fihla ntlheng ya **B** tlase sebakeng se theosetsang ka lebelo la 8 $m.s^{-1}$. Sebaka se theosetsang se etsa konsetente forekeshenale fose ya 72 N ho kereiti ha kereiti e thella ho tloha ntlheng ya **A** ho ya ntlheng ya **B.**



5.1 Fana ka work-energy theorem ka mantswe. (2)

5.2 Sebedisa eneji porinsipole ho khaltjhuleitha engele θ. (6)

Kamora ho feta ntlha ya **B**, kereiti e thella tseleng ya safeise e kgorofo e horisonthale moo e emang ho ntlha ya **C**,eo e leng 10 m ho tloha ho ntlha ya **B**.

5.3 Teroya free body diagram ya difose tsohle tse etsahalang ho kereiti nakong eo e thellang ho tloha ho **B** ho ya ho **C**. (3)

5.4 Khaltjhuleitha work done e entsweng ke forekeshenale fose ho fihlela kereiti e ema. (4)

[15]

POTSO 6

Koloi ya mapolesa ka saerini e buletsweng, e tsamaya ka lebelo le sa fetoheng dipakeng tsa diobserver tse pedi **A** le **B**. Observer **A** e tlwa modumo wa forekwensi ya 545 Hz ho tloha ho saerini, ha observer wa **B** e utlwa forekwensi ya 615 Hz.

6.1 Fana ka tlhaloso ya Doppler effect ka mantswe. (2)

6.2 Koloi ya mapolesa e ya lehlakoreng lefe?

Kgetha HO TLOHA HO OBSERVER **A** kapa HO TLOHA HO OBSERVER **B**.

Fana ka lebaka la karabo ya hao. (2)

6.3 Lebelo la modumo wa moya ke 343 $m.s^{-1}$. Khaltjhuleitha forekwensi ya saerini. (7)

6.4 Dispectral laine tsa kgase e itseng e obsefuweng ho tloha naleding e hole e hlaha e le red shifted. Hlalosa se bonwang o ipapisitse le MOTION OF THE STAR le FOREKWENSI ya mela ya sepeketerale. (2)

[13]

POTSO 7

Dipoint tjhatje tse pedi tsa, **P** le **T,** di beuwe 0,03 m di arohane. Tjhatje ya **P** ke +36 x 10^{-6} C ha T e na le tjhatje ya 16 x 10^{-6} C E SA TSEJWENG LETSHWAO.

7.1 Hlalosa Coulomb's law ka mantswe. (2)

7.2 Teroya electric field pattern ho potapota posetifo tjhatje. (3)

7.3 Khaltjhuleitha makenetjhute ya fose eo ditjhatje **P** le **T** di e etsetsanang. (3)

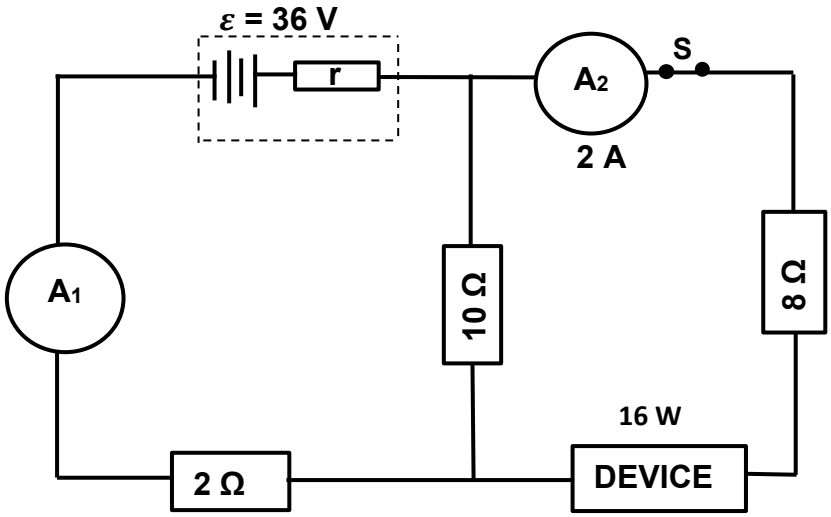
Ha test charge e beuwe ntlheng ya **X**, sebaka sa **r** m ho le letona ho **T** jwalo ka ha ho bontshitswe tayakeramong e ka tlase, test charge e dula e EME.

7.4 Ngola letshwao la tjhatje (POSETIFO kapa NEKETIFO) ya **T**.
Hlalosa karabo ya hao. (3)

7.5 Khaltjhuleitha bolelele ba **r**. (5)
[16]

POTSO 8

diresisetara tse tharo le defaese ya motlakase di reituwe 16 W di koneketuwe ho betiri ya emf ya 36 V le inthenale resisetense **r**, jwalo ka ha ho bontshiswe sekete tayakeramong e ka tlase. Ammeter $\mathbf{A_2}$ e bontsha 2 A ha switjhi **S** e kwatswe.



8.1 Hlalosa lentswe *emf* ya betiri ka mantswe. (2)

8.2 Khaltjhuleitha:

8.2.1 Resisetense ya sesebediswa sa motlakase (3)

8.2.2 Karente e fetang betiring. (5)

8.2.3 Inthenale resisetense **r** ya betiri. (6)

8.3 Switjhi **S** jwale e butswe. Sena se tla ama palo ya amethara $\mathbf{A_1}$ jwang?

Kgetha ho e a ATA ,E A FOKOTSEHA, kapa E DULA E LE JWALO.

Hlalosa karabo ya hao. (2)

[18]

POTSO 9

Phawara seteishene sa mashala e sebedisa diAC jenereita ho hlahisa motlakase.

9.1 Hlalosa eneji konfeshene e etsahalang jenereiteng. (2)

9.2 Teroya sketch graph ya emf e generated versus time ya disaekele tse pedi tse feletseng tsa AC jenereita. (2)

9.3 Olethaneiting kharente e sebediswa bakeng sa ho tsamaisa motlakase sebaka se setelele. Fana ka lebaka la hore hobaneng AC e kgethwa ho feta DC ho tsamaisa motlakase dibakeng tse telele. (1)

9.4 Ketlele ya motlakase e tshwauwe 220 V. 220 V e emetseng? (1)

9.5 AC jenereita e itseng e hlahisa peak current ya 6,25 A ha e koneketuwe ho ketlele ya motlakase ya resisetense ya 45 Ω.

Khaltjhuleitha:

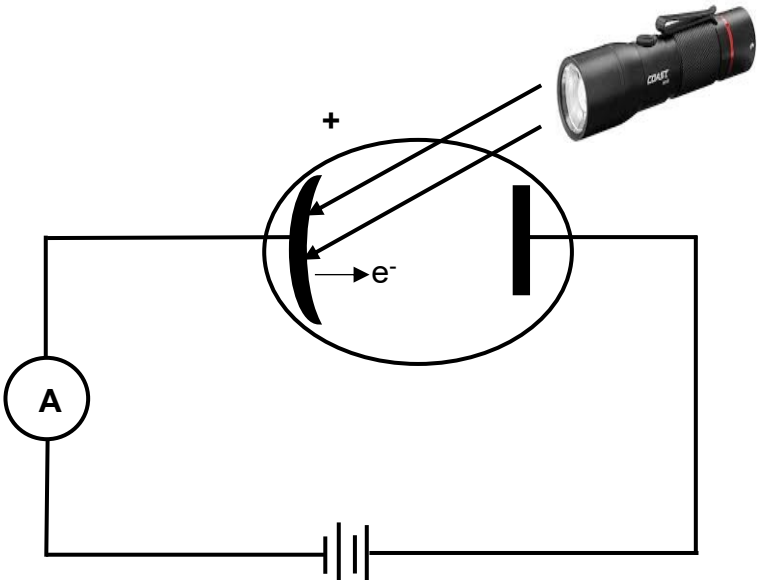
9.5.1 Root mean square (rms) current (3)

9.5.2 Average power e sebedisuweng ke ketlele ha e koneketuwe jenereiteng ena. (3)

[12]

POTSO 10

Dipatlisiso di entswe ho fumana efekete ya phawara ya light bulb karenteng e hlahisitsweng ke photo-electric cell. Aphareithase e sebedisitsweng dipatlisisong e bontshitswe teyakeramong e nolofaditsweng e ka tlase. Ultraviolet light ya wavelength ya 490 nm entshwa ke light bulb tse pedi , **A** le **B**, e kgantshitswe ho kathote ya photo-electric cell mme maximum sepiti sa phot-electrons sa methwa .



Diphetho tsa dipatlisiso tsa bona di bontshitswe tafoleng ka tlase.

BALEBO	PHAWARA YA LAETE BALEBO	LEBELO LA SEHLOHLOLONG LA DIPHOTO-ECTRON
A	100 W	$7,5 \times 10^5$ m·s^{-1}
B	200 W	$7,5 \times 10^5$ m·s^{-1}

10.1 Hlalosa lentswe *photoelectric effect.* (2)

10.2 Hlalosa ka ho hlaka hore hobanaeng phawara ya dllaete balebo e sa ame maximum sepiti se ntshuwang ke diphoto-electron? (2)

10.3 Ke efe E LE NNGWE ya light bulb, **A** le **B**, e tla hlahisa reding ya amethara e sehlohlolong?

Hlalosa karabo ya hao. (2)

10.4 Khaltjhuleitha:

10.4.1 Eneji ya ultraviolet photon (3)

10.4.2 Work function ya metal cathode (4)

[13]

TOTAL: 150

DATHA YA FISIKALE SAENSESE KEREITI 12

PAMPIRI YA 1 (FISIKISI)

TABLE 1: PHYSICAL CONSTANTS/*TAFOLE YA 1: DIFISIKALE KONSETENTE*

NAME/*LEBITSO*	SYMBOL/ *LETSHWAO*	VALUE/BOLENG
Acceleration due to gravity / *Akeselereishene ya kerafiti*	g	9,8 $m \cdot s^{-2}$
Universal gravitational constant / *Kerafiteishenale ya ho phatlalla*	G	$6,67 \times 10^{-11}\ N \cdot m^2 \cdot kg^{-2}$
Speed of light in a vacuum / *Lebelo la kganya fakhumung*	c	$3,0 \times 10^{8}\ m \cdot s^{-1}$
Planck's constant / *Planck's konsetente*	h	$6,63 \times 10^{-34}\ J \cdot s$
Coulomb's constant / *Coulomb konsetante*	k	$9,0 \times 10^{9}\ N \cdot m^2 \cdot C^{-2}$
Charge on electron / *Tjhatje ya eleketorone*	e	$-1,6 \times 10^{-19}\ C$
Electron mass / *Boima ba eleketorone*	m_e	$9,11 \times 10^{-31}\ kg$
Mass of earth / *Boima ba lefatshe*	M	$5,98 \times 10^{24}\ kg$
Radius of earth / *Rediyase ya lefatshe*	R_E	$6,38 \times 10^{6}\ m$

TAFOLE 2: FOMULARA

LEBELO

$v_f = v_i + a\Delta t$	$\Delta x = v_i\Delta t + \frac{1}{2}a\Delta t^2$ or/kapa $\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$
$v_f^{\,2} = v_i^{\,2} + 2a\Delta x$ or/kapa $v_f^{\,2} = v_i^{\,2} + 2a\Delta y$	$\Delta x = \left(\frac{v_i + v_f}{2}\right)\Delta t$ or/kapa $\Delta y = \left(\frac{v_i + v_f}{2}\right)\Delta t$

FOSE

$F_{net} = ma$	
$f_s^{max} = \mu_s N$	$f_k = \mu_k N$
$F_{net}\Delta t = \Delta p$ $\Delta p = mv_f - mv_i$	$w = mg$
	$g = G$

WEKE, ENEJI LE PHAWARA

$W = F \Delta x \cos \theta$	$U = mgh$ or/kapa $E_p = mgh$
$K = ½mv^2$ or/kapa $E_k = ½mv^2$	$W_{nett} = \Delta K$ or/kapa $W_{nett} = \Delta E_k$ $\Delta K = K_f - K_i$ or/ kapa $\Delta E_k = E_{kf} - E_{ki}$
$W_{nc} = \Delta K + \Delta U$ or/kapa $W_{nc} = \Delta E_k + \Delta E_p$	$P = \frac{W}{\Delta t}$
$P_{ave} = Fv$	

WAEFO, MODUMO LE KGANYA

$v = f\lambda$	$T = \frac{1}{f}$
$f_L = \frac{v \pm v_L}{v \pm v_s} f_s$ $\quad f_L = \frac{v \pm v_L}{v \pm v_b} f_b$	$E = hf$ or/kapa $E = h\frac{c}{\lambda}$
$E = W_o + E_{k(max)}$ where/moo $E = hf$ le $W_0 = hf_0$ and/le $E_{k(max)} = ½mv_{max}^2$ *or/kapa* $K_{(max)} = ½mv_{max}^2$	

ELEKETEROSETATIKESE

$F = \frac{kQ_1Q_2}{r^2}$	$E = \frac{kQ}{r^2}$
$V = \frac{W}{q}$	$E = \frac{F}{q}$
$n = \frac{Q}{q_e}$	

DIELETERIKI SEKETE

$R = \frac{V}{I}$	emf (ε) = I(R + r)
$R_s = R_1 + R_2 + R_3 + \ldots$ $\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \ldots$	Q = IΔt
W = Vq W = VIΔt $W = I^2R\Delta t$ W = _	$P = \frac{W}{\Delta t}$ P = VI $P = I^2R$ P =

OLETHANEITING KARENTE

$I_{rms} = \frac{I_{max}}{\sqrt{2}}$ / $I_{wgk} = \frac{I_{maks}}{\sqrt{2}}$	$P_{average} = V_{rms}I_{rms}$ / $P_{gemiddeld} = V_{wgk}I_{wgk}$
	$P_{average} = I_{rms}^2R$ / $P_{gemiddeld} = I_{wgk}^2R$
$V_{rms} = \frac{V_{max}}{\sqrt{2}}$ / $V_{wgk} = \frac{V_{maks}}{\sqrt{2}}$	$P_{average} = \frac{V_{rms}^2}{R}$ / $P_{gemiddeld} = \frac{V_{wgk}^2}{R}$