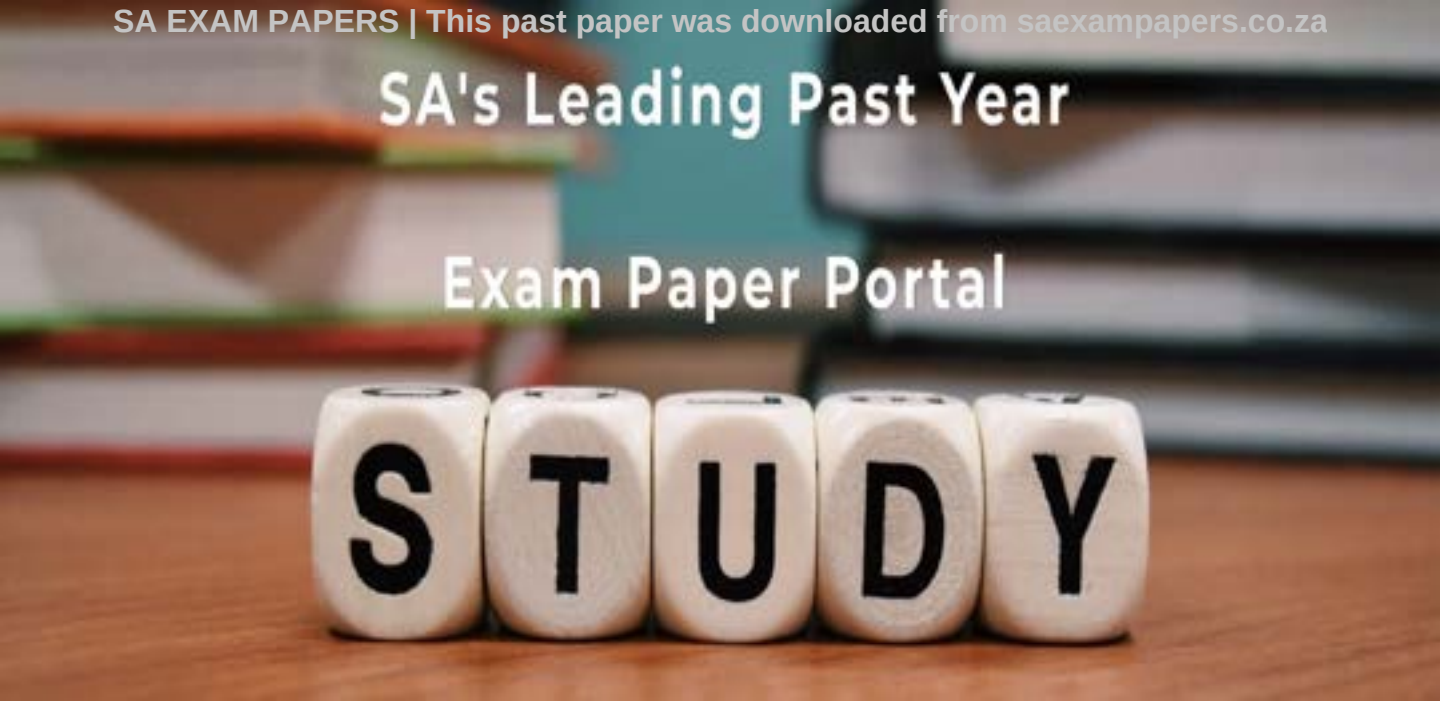


DEPARTMENT OF EDUCATION
DEPARTEMENT VAN ONDERWYS
LEFAPHA LA THUTO
ISEBE LEZEMFUNDO

PROVINCIAL PREPARATORY EXAMINATION/
PROVINSIALE VOORBEREIDENDE EKSAMEN

GRADE/*GRAAD 12*

PHYSICAL SCIENCES: PHYSICS
FISIESE WETENSKAPPE: FISIKA

PAPER/*VRAESTEL* 1

SEPTEMBER 2024

MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS/*PUNTE*: 150

These marking guidelines consist of 17 pages./
Hierdie nasienriglyne bestaan uit 17 bladsye.

QUESTION 1/*VRAAG 1*

1.1	D ✓✓	(2)
1.2	B ✓✓	(2)
1.3	B ✓✓	(2)
1.4	C ✓✓	(2)
1.5	C ✓✓	(2)
1.6	D ✓✓	(2)
1.7	B ✓✓	(2)
1.8	A ✓✓	(2)
1.9	A ✓✓	(2)
1.10	C ✓✓	(2)

[20]

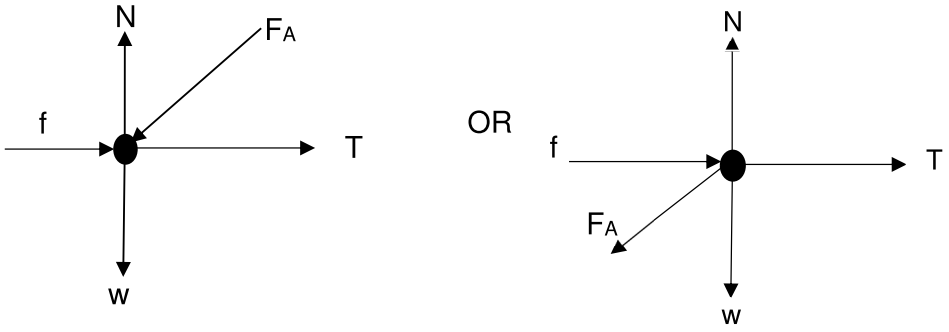
QUESTION 2/*VRAAG 2*

2.1

Marking criteria/*Nasienkriteria*
If any of the underlined key words/phrases in the **correct context** is omitted, deduct one mark./*Indien enige van die onderstreepte sleutel woorde/frases in die **korrekte konteks** uitgelaat is, trek 1 punt af.*

An object will remain in its state of rest or motion at constant velocity unless a (non-zero) resultant force/net force acts on it. ✓✓
'n Voorwerp sal in sy toestand van rus of beweging teen konstante snelheid bly, tensy 'n (nie-nul) resulterende krag/netto krag daarop inwerk. ✓✓ (2)

2.2



Force diagram 0/2./*Kragte diagram 0/2.*

Accepted labels/*Aanvaarde benoemings*	
w	F_w /Fg/mg/88,2 N/Weight/gravitational force *F_w /Fg/mg/88,2 N/Gewig/gravitasiekrag*
T	F_T /Tension/*Spanning*
$F_{applied}$	F /Applied force/F_A *F /Toegepaste krag/F_A*
f	F_f / f_k /frictional force/kinetic frictional force *F_f / f_k /wrywingskrag/kinetiese wrywingskrag*
N	F_N/Normal/*Normaal*

Notes/*Aantekeninge*
- Mark is awarded for label and arrow./*Punt word toegeken vir byskrif en pyltjie.*
- Do not penalise for length of arrows/*Moenie vir die lengte van die pyltjies penaliseer nie.*
- If arrows do not touch the dot/*Indien pyle nie die kolletjie raak nie:* Max/*Maks* $^4/_5$
- Any other additional force(s)/*Enige ander addisionele krag(te)* : Max/*Maks*: $^4/_5$
- If everything correct, but no arrows/*Indien alles korrek, maar geen pyltjies* Max/*Maks:* $^4/_5$

(5)

2.3

EAST AS POSITIVE ***OOS AS POSITIEF***	**EAST AS NEGATIVE** ***OOS AS NEGATIEF***
4 kg mass/*4 kg massa* $F_{net} = ma$ $T - w = ma$ $T - mg = ma$ } ✓ (Any one) $T - (4)(9,8) = (4)(0)$ ✓ $T = 39,2$ N	4 kg mass/*4 kg massa* $F_{net} = ma$ $T - w = ma$ $T - mg = ma$ } ✓ (Any one) $T - (4)(9,8) = (4)(0)$ ✓ $T = 39,2$ N
9 kg mass/*9 kg massa* $F_{net} = ma$ $F_x + T + f = ma$ $-F\cos 75^o + 39,2 + 2,5$ ✓ $= (9)(0)$ ✓ $F = 161,12$ N ✓ **OR/*OF*** $-F\sin 15^o + 39,2 + 2,5$ ✓ $= (9)(0)$ ✓ $F = 161,12$ N ✓	9 kg mass/*9 kg massa* $F_{net} = ma$ $F_x + T + f = ma$ $F\cos 75^o - 39,2 - 2,5$ ✓ $= (9)(0)$ ✓ $F = 161,12$ N ✓ **OR/*OF*** $F\sin 15^o - 39,2 - 2,5$ ✓ $= (9)(0)$ ✓ $F = 161,12$ N ✓

(5)
[12]

QUESTION 3/*VRAAG 3*

3.1

Marking criteria
If any of the underlined key words/phrases in the **correct context** is omitted deduct 1 mark./*Indien enige van die onderstreepte sleutelwoorde/frases in die **korrekte konteks** uitgelaat is, trek 1 punt af.*

A projectile is an object which has been given an initial velocity ✓and then it moves under the influence of gravitational force/gravity/weight only.✓
'n Projektiel is 'n voorwerp wat 'n beginsnelheid snelheid gegee is ✓ en dan beweeg dit slegs onder die invloed van gravitasiekrag/swaartekrag/gewig. ✓ (2)

3.2.1

UPWARDS AS POSITIVE ***OPWAARTS POSITIEF***	**DOWNWARDS AS POSITIVE** ***AFWAARTS POSITIEF***
$\Delta y = v_i\Delta t + \frac{1}{2} a\Delta t^2$✓	$\Delta y = v_i\Delta t + \frac{1}{2} a\Delta t^2$✓
1,5 ✓$= v_i (0,8) + \frac{1}{2} (-9,8)(0,8)^2$✓	-1,5 ✓$= -v_i(0,8) + \frac{1}{2} (9,8)(0,8)^2$✓
v_i = 5,80m.s^{-1}upwards /*opwaarts*✓	v_i = 5,80m.s^{-1}upwards /*opwaarts*✓

(4)

3.2.2 **POSITIVE MARKING FROM QUESTION 3.2.1**
POSITIEWE NASIEN VANAF VRAAG 3.2.1

OPTION 1/*OPSIE 1*	
UPWARDS AS POSITIVE ***OPWAARTS POSITIEF***	**DOWNWARDS AS POSITIVE** ***AFWAARTS POSITIEF***
$v_f^2 = v_i^2 + 2a\Delta y$✓	$v_f^2 = v_i^2 + 2a\Delta y$ ✓
$(5,80)^2 = (v_i)^2 + 2(-9,8)(8)$✓	$-(5,80)^2 = -(v_i)^2 + 2(9,8)8$✓
v_i = 13,80m.s^{-1} upwards/*opwaarts*✓	v_i = 13,80m.s^{-1}upwards/*opwaarts*✓
OPTION 2/*OPSIE 2*	
$\frac{1}{2} m v_i^2 + mgh_i = \frac{1}{2} m v_f^2 + mgh_f$ ✓	
$\frac{1}{2} mv_i^2 + 0 = \frac{1}{2} m(5,80)^2 + m(9,8)(8)$✓	
v_i =13,80 m.s^{-1}upwards/*opwaarts* ✓	

(3)

3.2.3

POSITIVE MARKING FROM QUESTION 3.2.2
POSITIEWE NASIEN VANAF VRAAG 3.2.2

$v_f^2 = v_i^2 + 2a\Delta y$
$1,4^2 = 13,8^2 + 2(-9,8)\Delta y$✓
Δy = 9,62 m

OR/*OF*

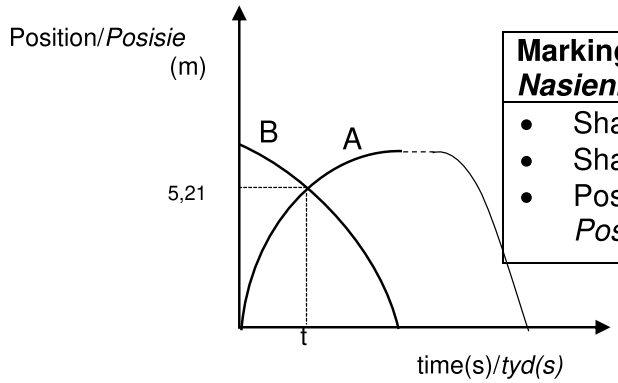
$\frac{1}{2} m v_i^2 + mgh_i = \frac{1}{2} m v_f^2 + mgh_f$
$\frac{1}{2} m(13,8)^2 + 0 = \frac{1}{2} m(1,4)^2 + m(9,8)(\Delta y)$ ✓
Δy = 9,62 m

$\Delta y = v_i\Delta t + \frac{1}{2} a\Delta t^2$✓
$\Delta y = 13,8\Delta t + \frac{1}{2} (-9,8)\Delta t^2$✓……(1)
$9,62 - \Delta y = 8\Delta t + 4,9\Delta t^2$✓ ……(2)
Δt = 0,44 s

$\Delta y = (13,8)(0,44) - (4,9)(0.44)^2$✓
Δy = 5,12 m ✓ (6)

3.3

POSITIVE MARKING FROM QUESTION 3.2.3
POSITIEWE NASIEN VANAF VRAAG 3.2.3



Marking guidelines ***Nasienriglyne***
• Shape of A/*Vorm van A*✓✓ • Shape of B/*Vorm van B*✓ • Position of t and 5,21/ *Posisie van t en* 5,21✓

(4)
[19]

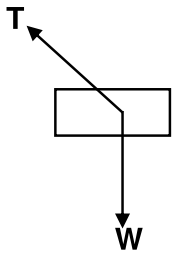
QUESTION 4/*VRAAG 4*

4.1

Marking criteria/*Nasienkriteria*
If any of the underlined key words/phrases in the **correct context** is omitted deduct 1 mark/*Indien enige van die onderstreepte sleutelwoorde/frases in die **korrekte konteks** uitgelaat is, trek 1 punt af.*

In an isolated/closed system the total (linear) momentum is conserved/remains constant. ✓✓
In 'n geïsoleerde/geslote sisteem bly die totale (lineêre) momentum behoue/konstant. ✓✓ (2)

4.2



If there is free-body diagram 0/2./*As ñ vrye liggaam diagram get eken word 0/2*

Accepted labels/*Aanvaarde benoemings*	
w	F_w /F_g /mg /gravitational force *F_w /F_g /mg/gravitasiekrag*
T	F_T/Tension *F_T/spanning*
Notes/*Aantekeninge*	
• Mark awarded for label and arrow./*Punt word toegeken vir byskrif en pyltjie.* • Do not penalise for length of arrows./*Moenie vir die lengte van die pyltjies penaliseer nie.*	

(2)

- Any other additional force(s)/*Enige ander addisionele krag(te)*: Max/*Maks* ½
- If everything is correct, but no arrows /*Indien alles korrek, maar geen pyltjies* Max/*Maks* ½
- If force(s) do not make contact with the dot:/*Indien krag(te) nie die kolletjie raak nie* Max/*Maks* ½

4.3

$v_f^2 = v_i^2 + 2a\Delta y$
$\underline{0^2 = v_i^2 + 2(-9,8)(0,15)}$ ✓
$v_i = 1,71\ m\cdot s^{-1}$

OR/OF

$(E_k + E_p)_i = (E_k + E_p)_f$
$½\ m\ v_i^2 + mgh_i = ½\ m\ v_f^2 + mgh_f$
$\underline{(½)(0,12)(v_i^2) + 0 = 0 + (0,12)(9,8)(0,15)}$ ✓
$v_i = 1,71\ m.s^{-1}$

OR/*OF*
$W_{net} = ½\ m\ v_f^2 - ½\ m\ v_i^2$
$\underline{(0,12)(9,8)(0,15)(\cos 180) = 0 - (½)(0,12)(v_i^2)}$ ✓
$v_i = 1,71\ m.s^{-1}$

OR/*OF*
$W_{nc} = mgh_f - mgh_i + ½\ m\ v_f^2 - ½\ m\ v_i^2$
$\underline{0 = (0,12)(9,8)(0,15) - 0 + 0 - (½)(0,12)(v_i^2)}$ ✓
$v_i = 1,71\ m.s^{-1}$

<u>OPTION 1/*OPSIE 1*</u>
EAST/RIGHT AS POSITIVE/*OOS/REGS AS POSITIEF*
$\Sigma p_i = \Sigma p_f$
$m_1v_i + m_2v_i = m_1v_f + m_2v_f$ } ✓Any one/*Enige een*
$\underline{(0,095)(2,45) + (0,12)(0)}$ ✓ $\underline{= (0,095)(v_f) + (0,12)(1,71)}$ ✓
$v_f = 0,29\ m\cdot s^{-1}$ ✓

WEST/LEFT AS POSITIVE/*WES/LINKS AS POSITIEF*
$\Sigma p_i = \Sigma p_f$
$m_1v_i + m_2v_i = (m_1 + m_2)v_f$ } ✓Any one /*Enige een*
$(0,095)(-2,45) + (0,12)(0)$ ✓ $= (0,095)(v_f) + (0,12)(-1,71)$ ✓
$v_f = -0,29\ m\cdot s^{-1}$
$v_f = 0,29\ m\cdot s^{-1}$ ✓
Range $(0,28\ m\cdot s^{-1} - 0,29\ m\cdot s^{-1})$

<u>OPTION 2/*OPSIE 2*</u>
EAST/RIGHT AS POSITIVE/*OOS/REGS AS POSITIEF*
$\Delta p_x = -\Delta p_y$
$m(v_{xf} - v_{xi}) = -m(v_{yf} - v_{yi})$ } ✓Any one/*Enige een*
$0,095(v_f - 2,45)$ ✓ $= -0,12(1,71 - 0)$ ✓
$v_f = 0,29\ m\cdot s^{-1}$ ✓

WEST/LEFT AS POSITIEF/*WES/LINKS AS POSITIEF*
$\Delta p_x = -\Delta p_y$
$m(v_{xf} - v_{xi}) = -m(v_{yf} - v_{yi})$ } ✓Any one/*Enige een*
$0,095(v_f + 2,45)$ ✓ $= -0,12(-1,71 - 0)$ ✓
$v_f = -0,29\ m\cdot s^{-1}$
$v_f = 0,29\ m\cdot s^{-1}$ ✓

(5)

4.4 **POSITIVE MARKING FROM QUESTION 4.3**
POSITIEWE NASIEN VANAF VRAAG 4.3

OPTION 1/*OPSIE 1*

EAST AS POSITIVE/*OOS AS POSITIEF*

$F_{net}\Delta t = \Delta p$
$F_{net}\Delta t = m(v_f - v_i)$ } ✓Any one/*Enige een*

$F_{net}(0,08) = 0,095(0,29 - 2,45)$ ✓ **OR/OF** $F_{net}(0,08) = 0,012(1,71 - 0)$ ✓

$F_{net} = -2,565$ N
$F_{net} = 2,57$ N✓

$F_{net} = 2,57$N✓

WEST AS POSITIVE/*WES AS POSITIEF*

$F_{net}\Delta t = \Delta p$
$F_{net}\Delta t = m(v_f - v_i)$ } ✓Any one/*Enige een*

$F_{net}(0,08) = 0,095(-0,29 + 2,45)$✓**OR/OF** $F_{net}(0,08) = 0,12(-1,71 - 0)$ ✓

$F_{net} = 2,57$ N✓

$F_{net} = 2,57$
$F_{net} = 2,57$ N✓

OPTION 2/OPSIE 2

EAST AS POSITIVE
OOS AS POSITIEF

$v_f = v_i + a\Delta t$
$0,29 = 2,45 + a(0,08)$ ✓
$a = -27$ m·s^{-2}
$F_{net} = ma$✓
$= 0,095\ (-27)$
$= -2,565$ N
$= 2,57$ N

WEST AS POSITIVE
WES AS POSITIEF

$v_f = v_i + a\Delta t$
$-0,29 = -2,45 + a(0,08)$ ✓
$a = 27$ m·s^{-2}
$F_{net} = ma$✓
$= 0,095\ (27)$
$= 2,57$ N✓

(3)
[12]

QUESTION 5/*VRAAG 5*

5.1 Potential energy to kinetic energy/*Potensiële energie na kinetiese energie*✓ (1)

5.2

Marking criteria/*Nasienkriteria*
If any of the underlined key words/phrases in the **correct context** is omitted deduct 1 mark/*Indien enige van die onderstreepte sleutelwoorde/frases in die **korrekte konteks** uitgelaat is, trek 1 punt af.*

A system in which the net external forces acting on the system is zero.✓✓
'n Sisteem waarin die netto eksterne kragte wat op die sisteem inwerk nul is (2)

5.3

OPTION 1/*OPSIE 1*
$\frac{1}{2} m v_i^2 + mgh_i = \frac{1}{2} m v_f^2 + mgh_f$✓
$\frac{1}{2}(100)(9,8)(20) + 0$ ✓ $= 0 + \frac{1}{2}(100)(v_f^2)$ ✓
$v_f = 19,80 \text{ m.s}^{-1}$✓

OPTION 2/*OPSIE 2*
$W_{net} = \frac{1}{2} m v_f^2 - \frac{1}{2} m v_i^2$✓
$(100)(20)(9,8)(\cos 0)$✓ $= \frac{1}{2}(100)(v_f^2)$ ✓ $- 0$
$v_f = 19,80 \text{ m.s}^{-1}$✓

OPTION 3/*OPSIE 3*
$W_{nc} = mgh_f - mgh_i + \frac{1}{2} m v_f^2 - \frac{1}{2} m v_i^2$✓
0✓ $= 0 - (100)(9,8)(20) + \frac{1}{2}(100) v_f^2 - 0$✓
$v_f = 19,80 \text{ m.s}^{-1}$✓ (4)

5.4.1 **POSITIVE MARKING FROM QUESTION 5.3**
POSITIEWE NASIEN VANAF VRAAG 5.3

OPTION 1/*OPSIE 1*
$W_{net} = \Delta E_k$ ✓
$W_{net} = \frac{1}{2}(100)(0)^2 - \frac{1}{2}(100)(19,80)^2$✓
$W_{net} = -19\,602 \text{ J}$
$W_{net} = W_G + W_f$
$-19\,602$✓ $= (100)(9,8)(\sin 30^\circ)(\Delta x)(\cos 180^\circ) + (200)(\Delta x)(\cos 180^\circ)$✓
$\Delta x = 28,41 \text{ m}$

$h = (28,41)(\sin 30^\circ)$✓
$h = 14,21 \text{ m}$✓

OPTION 2/*OPSIE 2*
$W_{nc} = \Delta E_p + \Delta E_k$
$W_{nc} = mgh_f - mgh_i + \frac{1}{2} m v_f^2 - \frac{1}{2} m v_i^2$
✓Any one/*Enige een*

$(200)\left(\frac{h}{\sin 30^\circ}\right)$ ✓$\cos 180^\circ$✓ $= (100)(9,8)(h) - 0$✓ $+ 0 - \frac{1}{2}(100)(19,80)^2$✓
$h = 14,20 \text{ m}$✓

OPTION 3/*OPSIE 3*

$F_{net} = ma$ ✓
$-(100)(9,8)(\sin 30^o)$✓ $- 200 = 100a$✓
$a = -6,9\ m.s^{-2}$

$v_f^2 = v_i^2 + 2a\Delta y$
$0^2 = 19,80^2 + 2(-6,9)(\Delta x)$ ✓
$\Delta x = 28,41\ m$

$h = (28,41)(\sin 30^o)$✓
$h = 14,21\ m$✓ (6)

5.4.2 Smaller than/*kleiner as* ✓
The net force acting on the object will decrease./*Die netto krag wat op die voorwerp inwerk sal verminder* ✓ (2)
[15]

QUESTION 6/*VRAAG 6*

6.1 **Marking criteria/*Nasienkriteria***
If any of the underlined key words/phrases in the **correct context** is omitted deduct 1 mark./*Indien enige van die onderstreepte sleutelwoorde/frases in die **korrekte konteks** uitgelaat is, trek 1 punt af.*

The change in frequency (or pitch) of the sound detected by a listener because the sound source and the listener have different velocities relative to the medium of sound propagation. ✓✓
Die verandering in frekwensie (of toonhoogte) van die klank waargeneem deur 'n luisteraar omdat die klankbron en die luisteraar verskillende snelhede relatief tot die medium waarin die klank voortgeplant word, het.

OR/*OF*

An (apparent) change in observed/detected frequency (pitch), as a result of the relative motion between a source and an observer (listener).
'n Skynbare verandering in waargenome frekwensie (toonhoogte), as gevolg van die relatiewe beweging tussen die bron en 'n waarnemer (luisteraar). (2)

6.2 Doppler ultrasound machine or Doppler flow meter/*Doppler-ultraklankmasjien of Doppler-vloeimeter* (**Any one**/***Enige een***). ✓ (1)

6.3

$f_L = \frac{v \pm v_L}{v \pm v_s} f_s$ **OR/*OF*** $f_L = \frac{v}{v - v_s} f_s$ ✓

$2\,450$ ✓ $= \frac{342}{342 - v_s}(2\,000)$ ✓

$v_s = 62{,}82\ m \cdot s^{-1}$

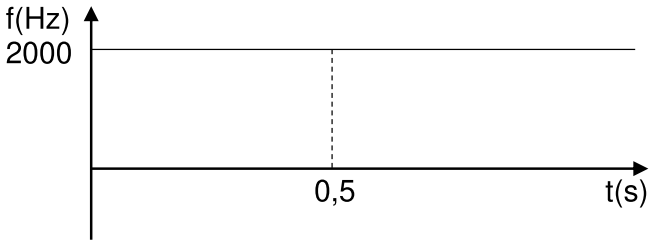
$\Delta v = \frac{\Delta x}{\Delta t}$ $62{,}82 = \frac{\Delta x}{0{,}5}$ ✓ $\Delta x = 31{,}41$ m ✓	$\Delta x = \left(\frac{v_i + v_f}{2}\right)\Delta t$ $\Delta x = \left(\frac{62{,}82 + 62{,}82}{2}\right)(0{,}5)$ $\Delta x = 31{,}41$ m

(5)

6.4

Marking guidelines/*Nasienriglyne*

- Shape of graph/*Vorm van grafiek*✓
- 2000 Hz and/*en* 0,5 s ✓



(2)

6.5 Shows that the Universe is expanding/*Toon dat die heelal besig is om uit te brei* ✓ (1)

[11]

QUESTION 7/*VRAAG 7*

7.1 NO/*NEE*✓

The spheres will lose their charge./The metal stands are electrical conductors.✓/*Die sfere sal hul lading verloor./Die metaalstaanders is elektriese geleiers.* (2)

7.2

Marking criteria/*Nasienkriteria*
If any of the underlined key words/phrases in the **correct context** is omitted deduct 1 mark *Indien enige van die onderstreepte sleutelwoorde/frases in die **korrekte konteks** uitgelaat is, trek 1 punt af.*

The (magnitude of the) electrostatic force exerted by one point charge on another point charge is directly proportional to the product of the (magnitudes of the) charges and inversely proportional to the square of the distance between them.✓✓/*Die (grootte van die) elektrostatiese krag wat een puntlading op 'n ander puntlading uitgeoefen, is direk eweredig aan die produk van die (groottes van die) ladings en omgekeerd eweredig aan die kwadraat van die afstand tussen hulle* (2)

If mass is used 0/2./*Indien massa gebruik word in plaas van* lading *0/2*

7.3

OPTION 1/*OPSIE 1*

$F = \frac{kQ_1Q_2}{r^2}$ ✓

$F_{CA} = \frac{(9\times10^{9})(12\times10^{-9})(6\times10^{-9})}{(0,25)^2}$ ✓ = 1,04 x 10^{-5} N

$F_{CB} = \frac{(9\times10^{9})(12\times10^{-9})(9\times10^{-9})}{(0,15)^2}$ ✓= 4,32 x 10^{-5} N

F_{net} =4,32×10^{-5} N - (1,04×10^{-5} N) ✓
= 3,28×10^{-5} N due East/ Right/*reg/ Oos* ✓

OPTION 2/*OPSIE 2*

$E = \frac{kQ}{r^2}$ ✓

$E_{CA} = \frac{(9\times10^{9})(6\times10^{-9})}{(0,25)^2}$ ✓ = 864 N·C^{-1}

$E_{CB} = \frac{(9\times10^{9})(9\times10^{-9})}{(0,15)^2}$ ✓ = 3 600 N·C^{-1}

E_{net} =3 600 - 864 = 2 736 N.C^{-1}due East

F = EQ ✓
= (2 736 × 12 × 10^{-9})✓
= 3,28×10^{-5} N due East/Right/*reg/Oos*✓

(5)

7.4.1 A to B /*A na B*✓✓ (2)

7.4.2

$$Q = \frac{Q_1 + Q_2}{2}$$

$$= \frac{(-6\times10^{-9}) + (9\times10^{-9})}{2} \checkmark$$

$$Q = 1,5 \times 10^{-9} \text{ C}$$

Charge transferred/*Lading oorgedra* = $1,5 \times 10^{-9}$ C – (-6×10^{-9} C)
= $7,5\times10^{-9}$ C

OR/*OF*

= ($1,5 \times 10^{-9}$ C – (9×10^{-9} C)
= $-7,5\times10^{-9}$ C

$$n = \frac{Q}{q_e} \checkmark$$

$$n = \frac{7,5\times10^{-9}}{1,6\times10^{-19}} \checkmark$$

n = $4,69 \times 10^{10}$ (electrons/*elektrone*) ✓ (4)

7.4.3

OPTION 1/*OPSIE 1*

$$E = \frac{kQ}{r^2} \checkmark$$

$$\frac{(9\times10^{9})(1,5\times10^{-9})}{(b)^2} \checkmark = \frac{(9\times10^{9})(12\times10^{-9})}{(0,25-b)^2} \checkmark$$

b = 0,07 m ✓

OPTION 2/*OPSIE 2*

$$F = \frac{kQ_1Q_2}{r^2} \checkmark$$

$$\frac{(9\times10^{9})(1,5\times10^{-9})Q}{(b)^2} \checkmark = \frac{(9\times10^{9})(12\times10^{-9})Q}{(0,25-b)^2} \checkmark$$

b = 0,07 m ✓ (4)

[19]

QUESTION 8/*VRAAG 8*

8.1

Marking criteria/*Nasienkriteria*
If any of the underlined key words/phrases in the **correct context** is omitted deduct 1 mark./*Indien enige van die onderstreepte sleutelwoorde/frases in die **korrekte konteks** uitgelaat is, trek 1 punt af.*

The resistance within a battery that causes a drop in the potential difference of the battery when there is a current in the circuit.✓✓ *Die weerstand binne 'n battery wat 'n daling in die potensiaalverskil van die battery veroorsaak wanneer daar 'n stroom in die stroombaan is.*

Accept/*Aan vaar*

Opposition to the flow of current/charges inside the battery due to its chemicals./*Werk teen die vloei van lading/stroom bihne die battery as gevolg van chemikaliee* (2)

8.2.1 $V = IR$✓
$= (0,5)(6 + 4)$✓
$= 5\ V$ ✓ (3)

8.2.2 **POSITIVE MARKING FROM QUESTION 8.2.1**
POSITIEWE NASIEN VANAF VRAAG 8.2.1.

OPTION 1/*OPSIE 1*

$\varepsilon = I(R + r)$ ✓
12✓ = 5 + 0,8I✓
I = 8,75 A

V = IR✓
5 = 8,25R✓
R = 0,61 Ω✓

OPTION 2/*OPSIE 2*

V = IR✓

$5 \checkmark = I\left(\frac{10R}{10+R}\right)$ ✓.....(1)

$12 \checkmark = I\left(\frac{10R}{10+R} + 0,8\right)$ ✓.....(2)

R = 0.61 Ω ✓ (6)

8.2.3 **POSITIVE MARKING FROM QUESTION 8.2.1 AND 8.2.2**
POSITIEWE NASIEN VANAF VRAAG 8.2.1 EN 8.2.2

OPTION 1/*OPSIE 1*	**OPTION 2/*OPSIE 2***	**OPTION 3/*OPSIE 3***
$W = I^2R\Delta t$ ✓ $= (8,25)^2(0,61)(180)$✓ = 7 473,26 J✓	$W = VI\Delta t$ ✓ = (5)(8,25)(180) ✓ = 7 425 J ✓	$W = \frac{V^2\Delta t}{R}$ ✓ $= \frac{(5)^2(180)}{0,61}$ ✓ = 7 377,05 J ✓

(3)

8.3 Increases/*Toeneem*✓

Total external resistance will increase✓ and total current will decrease, ✓
emf remains constant and internal voltage decreases.
Totale eksterne weerstand sal toeneem en totale stroom sal afneem, emk bly konstant en interne spanning neem af. (3)

[17]

QUESTION 9/*VRAAG 9*

9.1 Generator/*Generator*✓ ,
It converts mechanical energy to electrical energy.✓/*Dit skakel meganiese energie om na elektriese energie.*
Accept/*Aan vaar*
There is no energy source./*Daar is geen energie bron.* (2)

9.2 Coil/*Spoel*/Conductor/*Geleier/Armature/roterende spoel*✓ (1)

9.3 Good conductor of electricity/*Goeie geleier van elektrisiteit*/Does not rust/*Roes nie* ✓(**Any one/*Enige een***) (1)

9.4 A to/*na* B✓✓ (2)

9.5.1
$$f = \frac{1}{T}$$
$$= \frac{1}{0,02}\checkmark$$
$$= 50 \text{ Hz} \checkmark$$ (2)

9.5.2

OPTION 1/*OPSIE 1*	**OPTION 2/*OPSIE 2***
$V_{rms} = \frac{V_{max}}{\sqrt{2}}$	$V_{rms} = \frac{V_{max}}{\sqrt{2}}$
$= \frac{250}{\sqrt{2}}\checkmark$	$= \frac{250}{\sqrt{2}}\checkmark$
$= 176,78\ldots$ V	$= 176,78\ldots$ V
$I_{rms} = \frac{I_{max}}{\sqrt{2}}$	$I_{rms} = \frac{I_{max}}{\sqrt{2}}$
$I_{rms} = \frac{I_{max}}{\sqrt{2}}$	$I_{rms} = \frac{I_{max}}{\sqrt{2}}$
$= \frac{2}{\sqrt{2}}\checkmark$	$= \frac{2}{\sqrt{2}}\checkmark$
$= 1,41$A	$= 1,41$A
$P_{ave} = V_{rms}I_{rms}\checkmark$	$R = \frac{V_{rms}}{I_{rms}}$
$= (176,78)(1,41)\checkmark$	$= \frac{176,78}{1,41}$
$= 249,26$ W✓	$= 125,38\ \Omega$
	$P_{ave} = \frac{V_{rms}^2}{R}\checkmark$
	$= \frac{(176,78)^2}{125,38}\checkmark$
	$= 249,25$ W ✓

OPTION 3/*OPSIE 3*

$V_{rms} = \frac{V_{max}}{\sqrt{2}}$

$= \frac{250}{\sqrt{2}}$ ✓

$= 176,78\ldots$ V

$I_{rms} = \frac{I_{max}}{\sqrt{2}}$

$I_{rms} = \frac{I_{max}}{\sqrt{2}}$

$= \frac{2}{\sqrt{2}}$ ✓

$= 1,41$A

$R = \frac{V_{rms}}{I_{rms}}$

$= \frac{176,78}{1,41}$

$= 125,38\ \Omega$

$P_{ave} = I_{rms}^2 R$ ✓

$= (1,41)^2(125,38)$ ✓

$= 249,27$ W ✓

(5)
[13]

Note/Let wel: Range (249,25 – 250 W)

QUESTION 10/*VRAAG 10*

10.1.1 **Marking criteria**
If any of the underlined key words/phrases in the **correct context** is omitted deduct 1 mark /*Indien enige van die onderstreepte sleutelwoorde/frases in die **korrekte konteks** uitgelaat is, trek 1 punt af.*

The minimum frequency needed to emit an electron ✓ from (the surface of) a metal. ✓
Die minimum frekwensie wat nodig is om 'n elektron vanaf (die oppervlak van) 'n metaal uit te straal.

NOTE: If reference to work function 0/2
LET WEL: Indien verwysing na werkfunksie 0/2 (2)

10.1.2 D ✓
Frequency of light is less than the threshold frequency /$f < f_0$ / Energy of light is less than the work function of the metal /$E < W_0$ ✓
Frekwensie van lig is minder as die drumpelfrekwensie /$f < f_0$ / Energie van lig is minder as die werkfunksie van die metaal /$E < W_0$ ✓ (2)

10.1.3 $E = W_o + E_{k(max)}$
$E = W_o + K_{max}$] ✓(any one)
$(6{,}63\times10^{-34})(3{,}15\times10^{14})$✓ = $(6{,}63\times10^{-34})(0{,}06\times10^{14})$✓ + $\frac{1}{2}(9{,}11\times10^{-31})v^2$✓
$v = 6{,}71\times10^{5}\ m\cdot s^{-1}$✓ (5)

10.1.4 Remains the same /*Bly dieselfde* ✓ (1)

10.2 **Marking criteria/*Nasienkriteria***
If any of the underlined key words/phrases in the **correct context** is omitted deduct 1 mark/*Indien enige van die onderstreepte sleutel woorde/frases in die **korrekte konteks** uitgelaat is, trek 1 punt af.*

It is formed when certain frequencies of electromagnetic radiation are emitted due to an atom making a transition from a higher energy state to a lower energy state./*Dit word gevorm wanneer sekere frekwensies van elektromagnetiese straling uitgestraal word as gevolg van 'n atoom wat 'n oorgang maak van 'n hoër energietoestand na 'n laer energietoestand.* (2)

[12]

TOTAL/*TOTAAL*: 150