education

Department of Education
FREE STATE PROVINCE

PREPARATORY EXAMINATION
VOORBEREIDENDE EKSAMEN

GRADE/*GRAAD* 12

PHYSICAL SCIENCES P1 (PHYSICS)
FISIESE WETENSKAPPE V1 (FISIKA)

SEPTEMBER 2025

MARKS/*PUNTE*: 150

MARKING GUIDELINE
NASIENRIGLYNE

These marking guidelines consist of 15 pages.
Hierdie nasienriglyne bestaan uit 15 bladsye.

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Please turn over/*Blaai om asseblief*

QUESTION/*VRAAG* 1

1.1 C ✓✓
1.2 C ✓✓
1.3 B ✓✓
1.4 B ✓✓
1.5 A ✓✓
1.6 A ✓✓
1.7 C ✓✓
1.8 D ✓✓
1.9 B ✓✓
1.10 B ✓✓ (2 x 10) **[20]**

QUESTION/*VRAAG* 2

2.1

Marking Criteria/*Nasienkriteria*:
If any of the underlined keywords/phrases in the **correct context** are omitted, deduct 1 mark.
*Indien enige van die onderstreepte sleutelwoorde/frases in die **korrekte konteks** weggelaat word, trek 1 punt af.*

When a net force acts on an object, the object will accelerate in the direction of the force, and the acceleration is directly proportional to the force and inversely proportional to the mass of the object. ✓✓

Wanneer 'n netto krag op 'n voorwerp inwerk, sal die voorwerp in die rigting van die krag versnel, en die versnelling is direk eweredig aan die krag en omgekeerd eweredig aan die massa van die voorwerp. (2)

2.2



	Acceptable Labels/*Aanvaarbare byskrifte*
T	F_T / $F_{tension/spanning}$ / Tension force/*Spanningskrag*
F_g	weight / w / mg / $F_{gravitation/gravitasie}$

Notes/*Notas*:
- Mark is awarded for label and arrow./*Punt word toegeken vir etiket en pyl.*
- Do not penalise for the lengths of vectors./*Moenie penaliseer vir die lengtes van vektore nie.*
- If arrows do not touch the dot/*As pyle nie aan die kolletjie raak nie:* Max/*Maks* $(^1/_2)$
- Any additional force(s)/*Enige bykomende krag(te):* Max/*Maks* $(^1/_2)$
- No arrows drawn with correct labels/*Geen pyle geteken met korrekte byskrifte nie:* Max/*Maks* $(^1/_2)$

(2)

2.3 $w = mg$ ✓
$= \underline{(73)(9,8)}$ ✓
$= 715,4$ N ✓ (3)

2.4 **POSITIVE MARKING FROM/*POSITIEWE NASIEN VANAF* 2.3**

Marking Criteria/*Nasienkriteria*:
- Any correct formula for/*Enige korrekte formule vir* F_{net} ✓
- Correct substitution for/*Korrekte substitusie vir* $F_{net = ma}$ ✓
- Correct substitution for/*Korrekte substitusie vir* $\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$ ✓
- Correct substitution/*Korrekte substitusie* ✓
- Correct final answer/*Korrekte finale antwoord* ✓

OPTION/*OPSIE* 1	**OPTION/*OPSIE* 2**
Positive upwards: ***Positief opwaarts:*** $F_{net} = ma$ $T + w = ma$ ✓ any one/ *enige een* $\underline{780 - 715,4 = 73a}$ ✓ $a = 0,885\ m{\cdot}s^{-2}$ $\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$ ✓ $34 = 0 + \frac{1}{2}(0,885)(\Delta t^2)$ ✓ $\Delta t = 8,77$ s ✓	**Positive downwards:** ***Positief afwaarts:*** $F_{net} = ma$ $T + w = ma$ ✓ any one/*enige een* $\underline{-780 + 715,4 = 73a}$ ✓ $a = -0,885\ m{\cdot}s^{-2}$ $\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$ ✓ $-34 = 0 + \frac{1}{2}(-0,885)(\Delta t^2)$ ✓ $\Delta t = 8,77$ s ✓

(5)

2.5 When the man is at rest/*Wanneer die man in rus is*: $T_1 = w$ ✓
When he is moving up/*Wanneer hy op beweeg*: $T_2 = w + ma$
$\therefore T_2 > T_1$ ✓
T is greater when accelerating upwards. ✓
T is groter as versnelling opwaarts is. (3)
[15]

QUESTION/*VRAAG* 3

3.1 An object that has been given an initial velocity and then moves under the influence of the gravitational force ONLY. ✓✓ **(2 or/*of* 0)**
'n Voorwerp wat 'n aanvanklike snelheid gegee is, en dan onder die invloed van SLEGS gravitasiekrag beweeg. (2)

3.2.1

Marking Criteria/*Nasienkriteria*:
- Correct formula for/*Korrekte formule vir* $\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$ ✓
- Correct substitution into the formula ✓
  Korrekte substitusie in die formule
- Correct final answer/*Korrekte finale antwoord* ✓

OPTION/*OPSIE* 1	**OPTION/*OPSIE* 2**
Positive downwards: ***Positief afwaarts:***	**Positive upwards:** ***Positief opwaarts:***
$\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$ ✓ $12{,}5 = 0 + \frac{1}{2}(9{,}8)(\Delta t^2)$ ✓ $\Delta t = 1{,}597$ s ✓ Accept/*Aanvaar* $\Delta t = 1{,}6$ s	$\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$ ✓ $-12{,}5 = 0 + \frac{1}{2}(-9{,}8)(\Delta t^2)$ ✓ $\Delta t = 1{,}597$ s ✓ Accept/*Aanvaar* $\Delta t = 1{,}6$ s

(3)

3.2.2

Marking Criteria/*Nasienkriteria*:
- Formula for/*Formule vir* $\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$ ✓
- Correct substitution into formula for ball A ✓
  Korrekte substitusie in formule vir bal A
- Correct substitution into formula for ball B ✓✓
  Korrekte substitusie in formule vir bal B
- $\Delta y_A = \Delta y_B$ ✓
- Correct final answer./*Korrekte finale antwoord.* ✓

OPTION/*OPSIE* 1

Positive downwards/P*ositief afwaarts*:

Ball A/*Bal A*:

$\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$ ✓
$= 0 + \frac{1}{2}(9{,}8)(\Delta t^2)$ ✓ ……**eq. 1**
$= 4{,}9\Delta t$

any one/*enige een*

Ball B/*Bal B*:

$\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$
$= (30)(t-1)$ ✓ $+ \frac{1}{2}(9{,}8)(t-1)^2$ ✓ …… **eq. 2**
$= 4{,}9\Delta t^2 + 20{,}2t - 25{,}1$
$\Delta y_A = \Delta y_B$ ✓

$\Delta y_A = \Delta y_B$ ✓
$4{,}9t^2 = 4{,}9t^2 + 20{,}2t - 25{,}1$
$t = 1{,}24$ s ✓

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OPTION/*OPSIE* 2

Positive upwards/P*ositief opwaarts*:

Ball/*Bal* A:

$\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$ ✓
$\Delta y = 0 + \frac{1}{2}(-9{,}8)(\Delta t^2)$✓ ..... **eq. 1**

Ball/*Bal* B:

$\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$
$\Delta y = (-30)(t-1)$✓ $+ \frac{1}{2}(-9{,}8)(t-1)^2$✓ ..... **eq. 2**

$\Delta y_A = \Delta y_B$✓

$\frac{1}{2}(-9{,}8)(\Delta t^2) = (-30)(t-1) + \frac{1}{2}(-9{,}8)(t-1)^2$

$-4{,}9t^2 = -4{,}9t^2 - 20{,}2t + 25{,}1$
$t = 1{,}24\text{s}$ ✓

OPTION/*OPSIE* 3

Positive downwards/P*ositief afwaarts*:

Ball/*Bal A*:

$\Delta y_A = v_i\Delta t + \frac{1}{2}a\Delta t^2$ ✓
$\Delta y_A = 0 + \frac{1}{2}(9{,}8)(t+1)^2$✓ .....**eq. 1**

Ball/*Bal B*:

$\Delta y_B = v_i\Delta t + \frac{1}{2}a\Delta t^2$
$\Delta y_B = (30)(t)$✓ $+ \frac{1}{2}(9{,}8)(t)^2$✓ ..... **eq. 2**

$\Delta y_A = \Delta y_B$✓

$\frac{1}{2}(9{,}8)(t+1)^2 = (30)(t) + \frac{1}{2}(9{,}8)(t)^2$

$\Delta t = 0{,}24$
∴ time/*tyd* $= 1 + 0{,}24$
$= 1 + 0{,}24$ s ✓

OPTION/*OPSIE* 4
Positive upwards/*Positief opwaarts*: Ball/*Bal* A: $\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$ ✓ $\Delta y = 0 + \frac{1}{2}(-9{,}8)(t+1)^2$ ✓ ..... **eq. 1** Ball B/*Bal B*: $\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$ $\Delta y = (-30)(t)$ ✓ $+ \frac{1}{2}(-9{,}8)(t)^2$ ✓ ..... **eq. 2** $\Delta y_A = \Delta y_B$ ✓ $\frac{1}{2}(-9{,}8)(t+1)^2 = (-30)(t)$ ✓ $+ \frac{1}{2}(-9{,}8)(t)^2$ $\Delta t = 0{,}24$ $t = 0{,}24$ s ✓

(6)

3.2.3

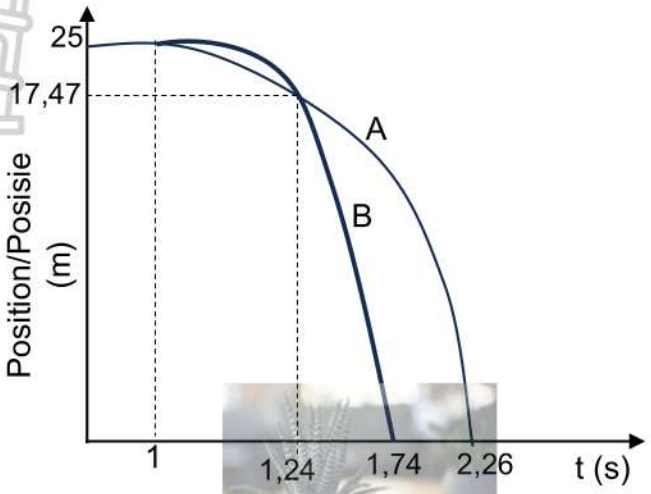
Marking Criteria/*Nasienkriteria*: • Correct formula for/*Korrekte formule vir* $v_f^2 = v_i^2 + 2a\Delta y$ ✓ • Correct substitution into the formula ✓ *Korrekte substitusie in die formule* • Correct final answer./*Korrekte finale antwoord.* ✓	
OPTION/*OPSIE* 1	**OPTION/*OPSIE* 2**
Positive downwards: ***Positief afwaarts*:** $v_f^2 = v_i^2 + 2a\Delta y$ ✓ $v_f^2 = (30^2) + 2(9{,}8)(25)$ ✓ $v_f = 37{,}28$ m·s^{-1} ✓	**Positive upwards:** ***Positief opwaarts:*** $v_f^2 = v_i^2 + 2a\Delta y$ ✓ $v_f^2 = (30^2) + 2(-9{,}8)(25)$ ✓ $v_f = -37{,}3$ m·s^{-1} $v_f = 37{,}28$ m·s^{-1} ✓

(3)

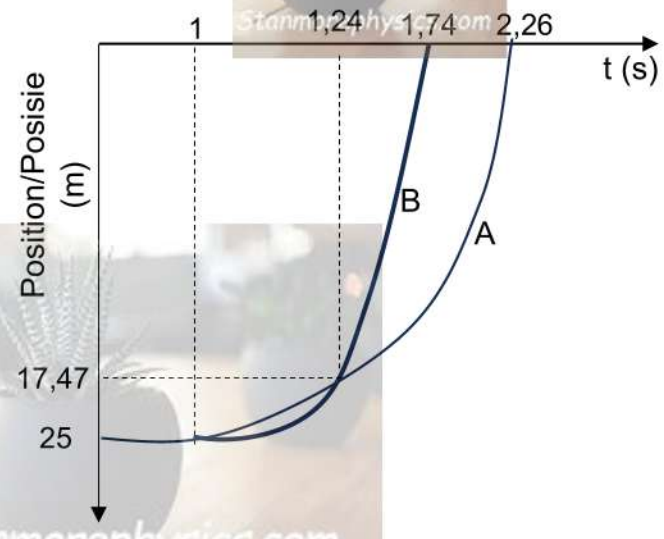
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3.3 **POSITIVE MARKING FROM/*POSITIEWE NASIEN VANAF* 3.2.1**

Positive downwards/ *Positief afwaarts*:



Positive upwards/ *Positief opwaarts*:



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(5)

Marking Criteria/*Nasienkriteria*:	
• Correct heights for balls **A** and **B** with the correct shape. *Korrekte hoogtes vir balle **A** en **B** met korrekte vorm.*	✓
• Correct times for balls **A** and **B** (**B** pass **A**). *Korrekte tye vir balle **A** en **B** (**B** beweeg verby **A**).*	✓
• Both balls pass each other at the same point. *Albei balle gaan op dieselfde punt by mekaar verby.*	✓
• Both balls end on the ground. *Albei balle eindig op die grond.*	✓
• Labels ball **A** and ball **B**. *Benoem bal **A** en bal **B**.*	✓

[19]

QUESTION/*VRAAG* 4

4.1

Marking Criteria/*Nasienkriteria*:
If any of the underlined keywords/phrases in the **correct context** are omitted, deduct 1 mark.
*Indien enige van die onderstreepte sleutelwoorde/frases in die **korrekte konteks** weggelaat word, trek 1 punt af.*

The <u>total</u> linear <u>momentum</u> of an isolated <u>system remains constant</u> (is conserved). ✓✓
Die <u>totale</u> lineêre <u>momentum</u> van 'n geïsoleerde <u>stelsel bly konstant</u> (word bewaar). (2)

4.2

Marking Criteria/*Nasienkriteria:*

- Correct formula for/*Korrekte formule vir* $\sum p_i = \sum p_f$ ✓
- Correct substitution to calculate $\sum p_i$ ✓
  Korrekte substitusie om $\sum p_i$ *te bereken*
- Correct substitution to calculate $\sum p_f$ ✓
  Korrtekte substitusie om $\sum p_f$ *te bereken*
- Correct final answer and direction. ✓
  Korrekte finale antwoord en rigting.

OPTION/*OPSIE* 1

Right as positive/*Regs as positief:*

$\sum p_i = \sum p_f$
$m_c v_{ic} + m_t v_{it} = m_c v_{fc} + m_t v_{ft}$ ✓any one/*enige een*
$(1200)(25) + (6000)(15)$✓ $= (1200)(16) + (6000)(v_{ft})$ ✓
$v_{ft} = 16{,}8\ m{\cdot}s^{-1}$ east/*oos* ✓

OPTION/*OPSIE* 2

Left as positive/*Links as positief:*

$\sum p_i = \sum p_f$
$m_c v_{ic} + m_t v_{it} = m_c v_{fc} + m_t v_{ft}$ ✓any one/*enige een*
$(1200)(-25) + (6000)(-15)$✓ $= (1200)(-16) + (6000)(v_{ft})$✓
$v_{ft} = -16{,}8\ m{\cdot}s^{-1}$
$v_{ft} = 16{,}8\ m{\cdot}s^{-1}$ east/*oos* ✓

(4)

4.3 **POSITIVE MARKING FROM/*POSITIEWE NASIEN VANAF* 4.2**

Marking Criteria/*Nasienkriteria*:

- Correct formula for/*Korrekte formule vir* E_{Ki}/ E_{Kf} ✓
- Correct substitution to calculate E_{Ki}✓
  Korrekte substitusie om E_{Ki} *te bereken*
- Correct substitution to calculate E_{Kf}✓
  Korrekte substitusie om E_{Kf} *te bereken*
- Correct calculation for/*Korrekte berekening vir* E_{Klost}✓
- Correct final answer./*Korrekte finale antwoord.* ✓

OPTION/*OPSIE* 1

Right as positive/*Regs as positief:*

$E_{K(before/voor)} = ½m_cv_{ic}^2 + ½m_tv_{it}^2$ ✓
$= ½(1200)(25^2) + ½(6000)(15^2)$ ✓
$= 105\ 0000$ J

$E_{K(after/na)} = ½m_cv_{fc}^2 + ½m_tv_{ft}^2$
$= ½(1200)(16^2) + ½(6000)(16{,}8^2)$ ✓
$= 1000320$ J

$E_{K(lost)} = E_{K(after/na)} - E_{K(before/voor)}$
$= 1000320 - 105\ 0000$ ✓
$= 4980$ J ✓

OPTION/*OPSIE* 2

Left as positive/*Links as positief:*

$E_{K(before/voor)} = ½m_cv_{ic}^2 + ½m_tv_{it}^2$ ✓
$= ½(1200)(-25^2) + ½(6000)(-15^2)$ ✓
$= 105\ 0000$ J

$E_{K(after/na)} = ½m_cv_{fc}^2 + ½m_tv_{ft}^2$
$= ½(1200)(-16^2) + ½(6000)(-16{,}8^2)$ ✓
$= 1000320$ J

$E_{K(lost)} = E_{K(after/na)} - E_{K(before/voor)}$
$= 1000320 - 105\ 0000$ ✓
$= 4980$ J ✓

(5)

4.4 Collision is inelastic./*Botsing is onelasties.* ✓
Energy is lost as sound energy and heat during the collision with the ground. ✓
Energie gaan verlore as klankenergie en hitte tydens die botsing met die grond.
(2)
[13]

QUESTION/*VRAAG* 5

5.1 A force for which the work done in moving an object between two points is independent of the path taken. ✓✓ **(2 or/*of* 0)**
'n Krag waarvoor die werk verrig is om 'n voorwerp tussen twee punte te beweeg, is onafhanklik van die pad wat geneem word. (2)

5.2 $\text{Gradient}/Gradiënt = \frac{\Delta y}{\Delta x} = \frac{\Delta E_k}{\Delta x}$ ✓
According to/*Volgens* $W_{net} = \Delta E_k$
$\therefore \frac{\Delta E_k}{\Delta x} = \frac{W_{net}}{\Delta t} = F_{net}$ ✓ (2)

5.3.1 $\text{Gradient}/Gradiënt = \frac{\Delta y}{\Delta x}$
$= \frac{160 - 24✓}{8-4✓}$
$= 34\ \text{N}✓$ (3)

5.3.2 **POSITIVE MARKING FROM/*POSITIEWE NASIEN VANAF* 5.3.1**

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Marking Criteria/*Nasienkriteria*:

- Correct formula for/*Korrekte formule vir* $F_{net}/W_{nc}/W_{net}$✓
- Correct substitution to calculate f/*Korrekte substitusie om* f *te bereken* ✓✓
- Correct final answer./*Korrekte finale antwoord.* ✓

OPTION/*OPSIE* 1

$F_{net} = F_A - f - F_{g//}$✓
$34✓ = 45 - f - (8)(9{,}8)\sin 25^\circ$✓
$f = 22{,}13\ \text{N}✓$

OPTION/*OPSIE* 2

$W_{nc} = \Delta E_K + \Delta E_p$
$W_{FA} + W_f = \Delta E_K + \Delta E_p$
$F_A\Delta x\cos\theta + F_f\Delta x\cos\theta = (½mv_f^2 - ½mv_i^2) + mgh_f - mgh_i$
} ✓ any one/*enige een*
$(45)(4)\cos 0° + (f)(4)\cos 180°✓ = (160 - 24) + (8)(9{,}8)(8\sin 25°) - (8)(9{,}8)(4\sin 25°)$✓
$f = 22{,}13\ \text{N}✓$

OPTION/*OPSIE* 3

$W_{net} = \Delta E_K$
$F_A\Delta x\cos\theta + F_f\Delta x\cos\theta + F_g\Delta x\cos\theta = \Delta E_K$
} ✓ any one/*enige een*
$(45)(4)\cos 0° + (f)(4)\cos 180° + (8)(9{,}8)\sin 25°(4)\cos 180°✓ = 160 - 24$✓
$f = 22{,}13\ \text{N}✓$

(4)

5.3.3 $E_K = \frac{1}{2}mv^2$
$24 = \frac{1}{2}(8)v^2$ ✓
$v = 2{,}45\ m\cdot s^{-1}$

$P_{ave/gem} = Fv_{ave/gem}$ ✓
$= (72)(2{,}45)$ ✓
$= 176{,}5\ W$ ✓ (4)

5.4 XY, ✓ net force will decrease, when frictional force increases. ✓
nettokrag sal afneem wanneer wrywingskrag toeneem. (2)
[17]

QUESTION/*VRAAG* 6

6.1 Doppler effect/*Doppler-effek* ✓ (1)

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

6.3 No relative motion between the listener and the source. ✓✓
Geen relatiewe beweging tussen die luisteraar en die bron nie. (2)

6.4 **POSITIVE MARKING FROM/*POSITIEWE NASIEN VANAF* 6.4**

Aircraft/*Vliegtuig* A

$$f_L = \frac{v_s}{v_s + v} f_S$$ ✓
$$570 = \frac{340}{340 + v_S} 600$$ ✓
$v_A = 17{,}89\ m.s^{-1}$ ✓

Aircraft/*Vliegtuig* B

$$f_L = \frac{v_s}{v_s + v} f_S$$
$$450 = \frac{340}{340 + v_S} 600$$ ✓
$v_B = 113{,}33\ m.s^{-1}$ ✓

Total distance after 1 min
Totale afstand na 1 min $= d_A + d_B$
$= (v \cdot \Delta t) + (v \cdot \Delta t)$
$= (17{,}89 \times 60) + (113{,}33 \times 60)$ ✓
$= 7873{,}4\ m$ ✓ (7)
[11]

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QUESTION/*VRAAG 7*

7.1

Marking Criteria/*Nasienkriteria*:
If any of the underlined keywords/phrases in the **correct context** are omitted, deduct 1 mark.
*Indien enige van die onderstreepte sleutelwoorde/frases in die **korrekte konteks** weggelaat word, 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 ofthe magnitudes of the charges and inversely proportional to the square of the distance between them. ✓✓

Die grootte van die elektrostatiese krag wat deur een puntlading op 'n ander puntlading uitgeoefen word, is direk eweredig aan die produk van die groottes van die ladings en omgekeerd eweredig aan die kwadraat van die afstand tussen hulle. (2)

NB: If reference to masses/If the word FORCE in context is omitted: $^0/_2$
***LW**: As na massas verwys word/As die woord KRAG in konteks weggelaat word:* $^0/_2$

7.2 To ensure that charges do not leak to the ground. ✓✓
Om te verseker dat ladings nie grond toe lek nie. (2)

7.3 $Q = ne$✓
$Q = (4{,}625 \times 10^{10})(1{,}6 \times 10^{-19})$ ✓
$Q = +7{,}4 \times 10^{-9}C$✓ Accept/*Aanvaar*: +7,4 nC (3)

7.4 **POSITIVE MARKING FROM/*POSITIEWE NASIEN VANAF* 7.3**

$$E = \frac{kQ}{r^2}\checkmark$$
$$E = \frac{(9\times10^{9})(7{,}4\times10^{-9})}{(0{,}9)^2}\checkmark$$
$$E = 82{,}22\ N.\ C^{-1}\checkmark$$ (3)

7.5 $F = \frac{KQ_1Q_2}{r^2}$ ✓

$= \frac{(9\times10^9)(7{,}4\times10^{-9})(5\times10^{-9})}{0{,}9^2}$ ✓

$= 4{,}1 \times 10^{-7}\text{N}$

$F = 4{,}1 \times 10^{-7} - (0{,}15 \times 4{,}1 \times 10^{-7})$ ✓

$= 3{,}49 \times 10^{-7}\text{N}$ (15% less/*minder*)

$F = \frac{KQ_1Q_2}{r^2}$

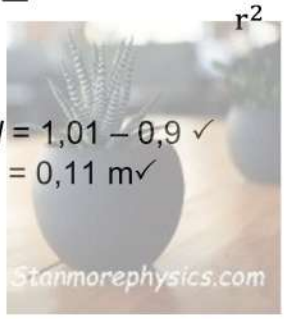
$3{,}49 \times 10^{-7} = \frac{(9\times10^9)(7{,}4\times10^{-9})(5\times10^{-9})}{r^2}$ ✓

$r = 1{,}01\text{ m}$

distance/*afstand* = 1,01 – 0,9 ✓

= 0,11 m✓ (6)

[16]



QUESTION/*VRAAG* 8

8.1 The potential difference across a conductor is directly proportional to the current in the conductor at constant temperature. ✓✓ **(2 or/*of* 0)**
Die potensiaalverskil oor 'n geleier is direk eweredig aan die stroom in die geleier by konstante temperatuur. (2)

8.2.1 0 (V) ✓ (1)

8.2.2 10 V ✓ (1)

8.3.1 7,5 V ✓ (1)

8.3.2 $\frac{1}{R_P} = \frac{1}{R_1} + \frac{1}{R_2}$ ✓

$= \frac{1}{6} + \frac{1}{3}$ ✓

$R_P = 2\ \Omega$

$R_T = R_S + R_P$

$= 1 + 2$ ✓

$= 3\Omega$

$R = \frac{V}{I}$ ✓

$3 = \frac{7{,}5}{I}$ ✓

$I = 2{,}5\text{ A}$ ✓ (6)

8.3.3 **POSITIVE MARKING FROM/*POSITIEWE NASIEN VANAF* 8.4**

OPTION/*OPSIE* 1	**OPTION/*OPSIE* 2**
$r = \frac{V}{I}$ ✓ $= \frac{2,5}{2,5}$ ✓ $= 1\ \Omega$ ✓	$E = I(R+r)$ ✓ $10 = 2,5(3+r)$ ✓ $r = 1\Omega$✓

(3)

8.4 Half ✓✓ **Accept**: Smaller/***Aanvaar:*** *Kleiner* (2)
[16]

QUESTION/*VRAAG* 9

9.1.1 Change in magnetic flux linkage ✓
Verandering in magnetiese vloedkoppeling (1)

9.1.2 A to/*tot* B ✓
(Flemmings) Right-hand rule/*Regterhandreël* ✓ (2)

9.1.3 Split-ring (commutator)/*Splitring (kommutator)* ✓ (1)

9.1.4 Use stronger magnet/*Gebruik sterk magneet* ✓ (1)
OR/*OF*
Increase emf/number of cells/*Verhoog emk/aantal selle*

9.2 $P_T = 120 + 100 = 220$ W

Daily energy consumption when S_1 and S_2 are closed:
Daaglikse energieverbruik wanneer S_1 en S_2 gesluit is:
$E_{daily/\,daagliks} = P\Delta t$ ✓
$\frac{220}{1000} \times 12 \text{ hrs} = 2,64$ kWh

Weekly energy consumption/*Weeklikse energieverbruik:*
$E_{daily/\,daagliks} = 2,64 \times 7$ ✓ $= 18,48$ kWh

Weekly cost of electricity/*Weeklikse koste van elektrisiteit*:

Cost/*Koste* = E × tarrif/*tarief*
$= 18,48 \times 9$ ✓ = R166,32

To save R36,00 per week/*Om R36,00 per week te spaar:*
Energy saving/*Krag gespaar* $= \frac{36}{9} = 4$ kWh per week/*per week* ✓

How long S_1 should be open/*Hoe lank S_1 oop moet wees*:

Energy saved per hour/*Krag per uur gespaar* $= \frac{120}{1000} = 0{,}12$ kW ✓

Hours required per week/*Ure per week vereis*:

$h = \frac{4}{0{,}12} = 33{,}33$ hours per week/*ure per week*

Daily duration to keep S_1 open/*Daaglikse duur om S_1 oop te hou:*

$\frac{33{,}33}{7}$ ✓ = 4,76 hours per day/*uur per week* ✓ (7)

[12]

QUESTION/*VRAAG* 10

10.1 The process whereby electrons are ejected from a metal surface when light of suitable frequency is incident on that surface. ✓✓ **(2 or 0)**
Die proses waardeur elektrone uit 'n metaaloppervlak gestoot word wanneer lig van geskikte frekwensie op daardie oppervlak inval. (2)

10.2 $E = \frac{hc}{\lambda}$ ✓

$= \frac{(6{,}63\times10^{-34})(3\times10^{8})}{(5{,}2\times10^{-7})}$ ✓

$= 3{,}82\times10^{-19}$ J ✓

$n = \frac{P}{E}$ ✓

$= \frac{(3{,}2\times10^{27})}{3{,}82\times10^{-19}}$ ✓

$= 8{,}38 \times 10^{45}$ photons per second/*fotone per sekonde* ✓ (6)

10.3.1 Increases/*Toeneem* ✓ (1)

10.3.2 Decreases/*Afneem* ✓ (1)

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

[11]

TOTAL/*TOTAAL*: 150

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