basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS/
NATIONAL SENIOR CERTIFICATE EXAMINATIONS/
SENIORSERTIFIKAAT-EKSAMEN/
NASIONALE SENIORSERTIFIKAAT-EKSAMEN

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

MAY/JUNE 2025/*MEI/JUNIE 2025*

MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS/*PUNTE*: 150

These marking guidelines consist of 21 pages.
Hierdie nasienriglyne bestaan uit 21 bladsye.

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QUESTION 1/*VRAAG 1*

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



[20]

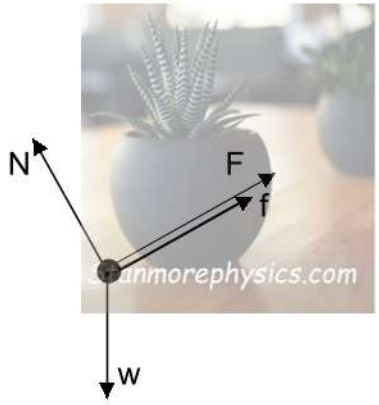
QUESTION 2/*VRAAG 2*

2.1

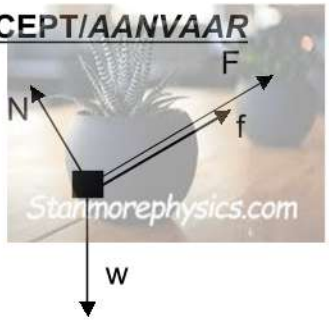
Marking criteria/*Nasienkriteria*
If any of the underlined key words/phrases in the **correct context** is omitted deduct 1 mark./*Indien enige van die onderstreepte sleutelwoorde/frases in die **korrekte konteks** uitgelaat is, trek 1 punt af.*

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

2.2



ACCEPT/*AANVAAR*



	Accepted labels/*Aanvaarde benoemings*
N	F_N/Normal/F_{normal}/*$F_{normaal}$/Normaal*
f	(kinetic) friction/F_f/ f_k/ *(kinetiese) wrywing*/F_w
F	Applied force/Toegepaste krag
w	F_g/F_w/weight/mg/245 N/gravitational force *F_g/F_w/gewig/mg/245 N/gravitasiekrag*

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* $^3/_4$
- Any other additional force(s)/*Enige ander addisionele krag(te): Max*/*Maks* $^3/_4$
- If everything correct, but no arrows/*Indien alles korrek, maar geen pyltjies*: Max/*Maks* $^3/_4$ (4)

2.3

DOWNWARDS AS POSITIVE/ *AFWAARTS AS POSITIEF*	**UPWARDS AS POSITIVE/ *OPWAARTS AS POSITIEF***
$F_{net} = ma$ $w_{\parallel} - F - f_k = ma$ $mg\sin\theta - F - f_k = ma$ ✓ Any one/ *Enige een* $25(9,8)\sin30° - F - 40 = 4(0)$ ✓ $F = 82,50$ N ✓	$F_{net} = ma$ $-w_{\parallel} + F + f_k = ma$ $-mg\sin\theta + F + f_k = ma$ ✓ Any one/ *Enige een* $-25(9,8)\sin30° + F + 40 = 4(0)$ ✓ $F = 82,50$ N ✓

(3)

2.4

$F_{net} = 0$
$F_{g//} = f$ ✓Any one/*Enige een*
$F_{g//} - f = F_{net} = 0$
$mg\sin\theta$ ✓$= \mu_K mg\cos\theta$✓
$\mu_K = \frac{\sin\theta}{\cos\theta}$

(3)

2.5

$\tan\theta = 0,19$
$\theta = 10,76°$✓

$f_K = (\mu_k mg\cos\theta)$
$= \underline{(0,19)(25)(9,8)\cos 10,76}$✓
$= 45,73$ N ✓

(3)
[16]

QUESTION 3/*VRAAG 3*

3.1 <u>Motion</u> under the influence of <u>gravitational force only</u>. ✓✓
Accept weight for gravitational force.
<u>Beweging slegs</u> onder die invloed van <u>gravitasiekrag</u>.
Aanvaar swaartekrag/gewig vir gravitasiekrag.
(2 or/*of* 0)
OR/*OF*
<u>Motion</u> in which the <u>only force</u> acting is <u>gravitational force</u>. ✓✓
Accept weight for gravitational force.
<u>Beweging</u> waar die <u>enigste krag</u> wat inwerk, <u>gravitasiekrag</u> is.
Aanvaar swaartekrag/gewig vir gravitasiekrag.
(2 or/of 0)

NOTE: If projectile is defined: $^0/_2$
LET WEL: Indien projektiel gedefinieer is: $^0/_2$

(2)

3.2

Marking criteria /*Nasienkriteria*

- Correct formula for Δy./*Korrekte formule vir* Δy.✓
- Correct substitution into formula for **A-B**./*Korrekte vervanging in formule vir **A-B***. ✓
- Correct substitution into formula for **B-C** or **A-C**./ *Korrekte vervanging in formule vir **B-C** of **A-C***. ✓
- Equating v_f at B and v_i at B or ratio $\frac{8}{1}$/ *Gelykstelling van v_f by B en v_i by B of verhouding* $\frac{8}{1}$. ✓

UPWARDS AS POSITIVE/*OPWAARTS AS POSITIEF*



OPTION 1/*OPSIE 1*

A-B

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

$-h = \underline{(0) + \frac{1}{2}(-9,8)(t)^2}$ ✓

$h = 4,9\ t^2$

A-C

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

$\underline{-9h = (0)(t + 2) + \frac{1}{2}(-9,8)(t + 2)^2}$ ✓

$9h = (4,9)(t + 2)^2$

$9t^2 = (t + 2)^2$✓

$3t = (t + 2)$

$t = 1$ s

OPTION 2/*OPSIE 2*

A-B

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

$\underline{-h = (0)t + \frac{1}{2}(-9,8)\ t^2}$ ✓

$-h = -4,9\ t^2$

B-C

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

$\underline{-8h = v_i(2) + \frac{1}{2}(-9,8)(2)^2}$ ✓

$= 2v_i - 19,6$

$v_i = \frac{(-8h + 19,6)}{2}$

A-B & B-C

$v_f = v_i + a\Delta t$

$v_f = \underline{0 + (-9,8)\ t}$

$v_{i(B\text{-}C)} = v_{f(A\text{-}B)}$ ✓Any one / *Enige een*

$\frac{(-8h + 19,6)}{2} = (-9,8)\ t$

$-8(4,9\Delta t^2) = (-19,6)\Delta t - 19,6$

$2t^2 - t - 1 = 0$

$t = 1$ s

OPTION 3/*OPSIE 3*



A-B

$v_f^2 = v_i^2 + 2a\Delta y$ ✓

$= \underline{(0) + 2 - (9,8)(h)}$

$v_B = -\sqrt{19,6h}$

✓✓Both /*Beide*

B-C

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

$\underline{-8h = v_b(2) + \frac{1}{2}(-9,8)(2)^2}$

$-8h = 2(-\sqrt{19,6h}) - 19,6$

$8h + 2\sqrt{19,6h} = 19,6$

$h = 4,9$

A-B

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

$\underline{-4,9 = (0) + \frac{1}{2}(-9,8)(t)^2}$ ✓

$t = 1$ s

UPWARDS AS POSITIVE/*OPWAARTS AS POSITIEF*

OPTION 4/*OPSIE 4*



A-B

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

$-h = \underline{(0) + \frac{1}{2}(-9,8)(1)^2}$ ✓

$-h = -4,9$ m

$v_f = v_i + a\Delta t$

$= \underline{0 + (-9,8)(1)}$

$= -9,8\ m\cdot s^{-1}$

B-C

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

$-8h = \underline{v_i(2) + \frac{1}{2}(-9,8)(2)^2}$ ✓

$= \underline{(-9,8)(2)} - 19,6$

$= -39,2$ m

When/*wanneer* t = 1 s,

$\Delta y_{(B\text{-}C)} : \Delta y_{(A\text{-}B)} = 39,2 : 4,9 = 8:1$ ✓

OR/*OF* $\frac{39,2}{4,9} = \frac{8}{1} = \frac{8h}{h}$ ✓

OPTION 5/*OPSIE 5*

A-B

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

$-h = \underline{(0) + \frac{1}{2}(-9,8)(1)^2}$ ✓

$-h = -4,9$ m

$v_f = v_i + a\Delta t$

$= \underline{0 + (-9,8)(1)}$

$= -9,8\ m\cdot s^{-1}$

B-C

$v_f = v_i + a\Delta t$

$= \underline{(-9,8) + (-9,8)(1)}$ ✓

$= -29.4\ m\cdot s^{-1}$

$\Delta y = \left(\frac{v_i + v_f}{2}\right)\Delta t$

$-8h = \left(\frac{-9,8 + (-29,4)}{2}\right)(2)$

$= -39,2$ m

When/*wanneer* t = 1 s,

$\Delta y_{(B\text{-}C)} : \Delta y_{(A\text{-}B)} = 39,2 : 4,9 = 8:1$ ✓

OR/*OF* $\frac{39,2}{4,9} = \frac{8}{1} = \frac{8h}{h}$ ✓

OPTION 6/*OPSIE 6*



A-B

$v_f = v_i + a\Delta t$

$= 0 + (-9,8)(1)$

$v_f = -9,8\ m\cdot s^{-1}$

$\Delta y = \left(\frac{v_i + v_f}{2}\right)\Delta t$ ✓

$h = \left(\frac{-9,8 + 0}{2}\right)(1)$ ✓

$= -4,9$ m

B-C

$v_f = v_i + a\Delta t$

$= \underline{(-9,8) + (-9,8)(2)}$

$= -29,4\ m\cdot s^{-1}$

$h = \left(\frac{-9,8 + (-29,4)}{2}\right)(2)$ ✓

$= -39,2$ m

When/*wanneer* t = 1 s,

$\Delta y_{(B\text{-}C)} : \Delta y_{(A\text{-}B)} = 39,2 : 4,9 = 8:1$ ✓

OR/*OF* $\frac{39,2}{4,9} = \frac{8}{1} = \frac{8h}{h}$ ✓

OPTION 7/*OPSIE 7*

A-B

$v_f = v_i + a\Delta t$

$= 0 + (-9,8)(1)$

$v_f = -9,8\ m\cdot s^{-1}$

$v_f^2 = v_i^2 + 2a\Delta y$ ✓

$(-9,8)^2 = (0)^2 + (2)(-9,8)(h)$ ✓

$h = -4,9$ m

(accept/*aanvaar* h = 4,9 m)

B-C

$v_f = v_i + a\Delta t$

$= \underline{(-9,8) + (-9,8)(2)}$

$= -29,4\ m\cdot s^{-1}$

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

$(-29,4)^2 = (-9,8)^2 + (2)(-9,8)(h)$ ✓

$h = -39,2$ m

When/*wanneer* t = 1 s,

$\Delta y_{(B\text{-}C)} : \Delta y_{(A\text{-}B)} = 39,2 : 4,9 = 8:1$ ✓

OR/*OF* $\frac{39,2}{4,9} = \frac{8}{1} = \frac{8h}{h}$ ✓

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DOWNWARDS AS POSITIVE/*AFWAARTS AS POSITIEF*

OPTION 1/*OPSIE 1*

A-B

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

$h = \underline{(0) + \frac{1}{2}(9,8)(t)^2}$ ✓

$h = 4,9\ t^2$

A-C

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

$\underline{9h = (0)(t + 2) + \frac{1}{2}(9,8)(t + 2)^2}$ ✓

$9h = (4,9)(t + 2)^2$

$9t^2 = (t + 2)^2$ ✓

$3t = (t + 2)$

$t = 1$ s





OPTION 2/*OPSIE 2*

A-B

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

$h = \underline{(0)\ t + \frac{1}{2}(9,8)\ t^2}$ ✓

$h = 4,9\ t^2$

B-C

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

$\underline{8h = v_i(2) + \frac{1}{2}(9,8)(2)^2}$ ✓

$= 2v_i + 19,6$

$v_i = \dfrac{(8h - 19,6)}{2}$

A-B & B-C

$v_f = v_i + a\Delta t$

$v_f = 0 + (9,8)\ t$

$v_{i(B-C)} = v_{f(A-B)}$ ✓Any one / *Enige een*

$\dfrac{(8h - 19,6)}{2} = (9,8)\ t$

$8(4,9t^2) = (19,6)\ t + 19,6$

$2t^2 - t - 1 = 0$

$t = 1$ s

OPTION 3/*OPSIE 3*

A-B

$v_f^2 = v_i^2 + 2a\Delta y$ ✓

$= \underline{(0) + 2(9,8)(h)}$

$v_B = \sqrt{19,6h}$ ✓✓Both /*Beide*

B-C

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

$\underline{8h = v_b(2) + \frac{1}{2}(9,8)(2)^2}$

$8h = 2(\sqrt{19,6h}) + 19,6$

$8h - 2\sqrt{19,6h} = 19,6$

$h = 4,9$ m

A-B

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

$\underline{4,9 = (0) + \frac{1}{2}(9,8)(t)^2}$ ✓

$t = 1$ s



DOWNWARDS AS POSITIVE/AF*WAARTS AS POSITIEF*



OPTION 4/*OPSIE 4*

A-B

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

$h = \underline{(0) + \frac{1}{2}(9,8)(1)^2}$ ✓

$h = 4,9$ m

$v_f = v_i + a\Delta t$

$= \underline{0 + (9,8)(1)}$

$= 9,8\ m\cdot s^{-1}$

B-C

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

$= \underline{v_i(2) + \frac{1}{2}(9,8)(2)^2}$ ✓

$= \underline{(9,8)(2)} + 19,6$

$= 39,2$ m

When t = 1 s,

$\Delta y_{(B-C)} : \Delta y_{(A-B)} = 39,2 : 4,9 = 8:1$ ✓

OR/*OF* $\frac{39,2}{4,9} = \frac{8}{1} = \frac{8h}{h}$ ✓

OPTION 5/*OPSIE 5*

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

$h = \underline{(0) + \frac{1}{2}(9,8)(1)^2}$ ✓

$h = 4,9$ m

$v_f = v_i + a\Delta t$

$= \underline{0 + (9,8)(1)}$

$= 9,8\ m\cdot s^{-1}$

B-C

$v_f = v_i + a\Delta t$

$= \underline{(9,8) + (9,8)(1)}$ ✓

$= 29.4$ m

$\Delta y = \left(\frac{v_i + v_f}{2}\right)\Delta t$

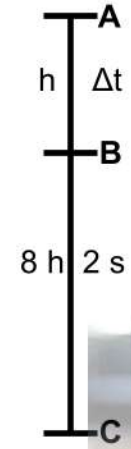
$= \left(\frac{9,8 + 29,4)}{2}\right)(2)$

$= 39,2$ m

When/*wanneer* t = 1 s,

$\Delta y_{(B-C)} : \Delta y_{(A-B)} = 39,2 : 4,9 = 8:1$ ✓

OR/*OF* $\frac{39,2}{4,9} = \frac{8}{1} = \frac{8h}{h}$ ✓



OPTION 6/*OPSIE 6*

A-B

$v_f = v_i + a\Delta t$

$= 0 + (9,8)(1)$

$v_f = 9,8\ m\cdot s^{-1}$

$\Delta y = \left(\frac{v_i + v_f}{2}\right)\Delta t$ ✓

$h = \left(\frac{9,8 + 0}{2}\right)(1)$ ✓

$= 4,9$ m

B-C

$v_f = v_i + a\Delta t$

$= \underline{(9,8) + (9,8)(2)}$

$= 29,4$ m

$h = \left(\frac{9,8 + (29,4)}{2}\right)(2)$ ✓

$= 39,2$ m

When/*wanneer* t = 1 s,

$\Delta y_{(B-C)} : \Delta y_{(A-B)} = 39,2 : 4,9 = 8:1$ ✓

OR/*OF* $\frac{39,2}{4,9} = \frac{8}{1} = \frac{8h}{h}$ ✓

OPTION 7/OP*SIE 7*

A-B

$v_f = v_i + a\Delta t$

$= 0 + (9,8)(1)$

$v_f = 9,8\ m\cdot s^{-1}$

$v_f^2 = v_i^2 + 2a\Delta y$ ✓

$(9,8)^2 = (0)^2 + (2)(9,8)(h)$ ✓

$h = 4,9$ m

B-C

$v_f = v_i + a\Delta t$

$= \underline{(9,8) + (9,8)(2)}$

$= 29,4$ m

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

$(29,4)^2 = (9,8)^2 + (2)(9,8)(h)$

$h = 39,2$ m

When/*wanneer* t = 1 s,

$\Delta y_{(B-C)} : \Delta y_{(A-B)} = 39,2 : 4,9 = 8:1$ ✓

OR/*OF* $\frac{39,2}{4,9} = \frac{8}{1} = \frac{8h}{h}$ ✓

(4)

3.3 **POSITIVE MARKING FROM QUESTION 3.2**
POSITIEWE NASIEN VANAF VRAAG 3.2

Marking criteria/*Nasienkriteria*
- Formula to calculate v_f/*Formule om* v_f *te bereken* ✓
- Substitution of/*Vervanging van* $\Delta t_{(A-C)} = 3$ s OR/*OF* $\Delta t_{(A-B)} = 1$ s AND/*EN* $\Delta t_{(B-C)} = 2$ s.✓
- Correct final answer/Korrekte f*inale antwoord*: 29,4 m·s^{-1} ✓

NOTE/*NOTA*
v_f and v_i can be swopped
v_f *en* v_i *kan omgeruil word*

UPWARDS AS POSITIVE/ *OPWAARTS AS POSITIEF*

OPTION 1/*OPSIE 1*

A-C
$v_f = v_i + a\Delta t$ ✓
$= 0 + (-9,8)(3)$ ✓
$v_f = -29,4$
$v_f = 29,4$ m·s^{-1}✓

OPTION 2/*OPSIE 2*

A-B
$v_f = v_i + a\Delta t$ ✓
$= 0 + (-9,8)(1)$
$v_f = -9,8$ m·s^{-1}
✓Both /*Beide*

B-C
$v_f = v_i + a\Delta t$
$v_f = -9,8 + (-9,8)(2)$
$v_f = -29,4$
$v_f = 29,4$ m·s^{-1}✓

A
1s
B
2s
C

A-C
$\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$
$= (0)(3) + \frac{1}{2}(-9,8)(3)^2$
$\Delta y = -44,1$ m

OPTION 3/*OPSIE 3*

A-C
$v_f^2 = v_i^2 + 2a\Delta y$ ✓
$v_f^2 = (0)^2 + (2)(-9,8)(-44,1)$ ✓
$v_f = 29,4$ m·s^{-1}✓

OPTION 4/*OPSIE 4*

A-C
$\Delta y = \left(\frac{v_i + v_f}{2}\right)\Delta t$ ✓
$-44,1 = \left(\frac{0 + v_f}{2}\right)(3)$ ✓
$v_f = -29,4$
$v_f = 29,4$ m·s^{-1}✓

A-B
$v_f = v_i + a\Delta t$
$= 0 + (-9,8)(1)$
$v_f = -9,8$ m·s^{-1}

B-C
$\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$
$= (-9,8)(2) + \frac{1}{2}(-9,8)(2)^2$
$\Delta y = -39,2$ m

OPTION 5/*OPSIE 5*

B-C
$v_f^2 = v_i^2 + 2a\Delta y$ ✓
$v_f^2 = (-9,8)^2 + (2)(-9,8)(-39,2)$ ✓
$v_f = -29,4$
$v_f = 29,4$ m·s^{-1}✓

OPTION 6/*OPSIE 6*

B-C
$\Delta y = \left(\frac{v_i + v_f}{2}\right)\Delta t$ ✓
$-39,2 = \left(\frac{-9,8 + v_f}{2}\right)(2)$ ✓
$v_f = -29,4$
$v_f = 29,4$ m·s^{-1}✓

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DOWNWARDS AS POSITIVE/*AFWAARTS AS POSITIEF*

OPTION 1/*OPSIE 1*

A-C

$v_f = v_i + a\Delta t$ ✓
$= 0 + (9,8)(3)$ ✓
$v_f = 29,4\ m\cdot s^{-1}$ ✓

OPTION 2/*OPSIE 2*

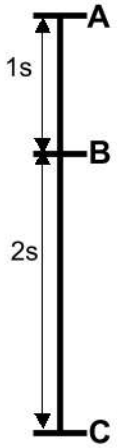
A-B

$v_f = v_i + a\Delta t$ ✓
$= 0 + (9,8)(1)$
$v_f = 9,8\ m\cdot s^{-1}$

B-C

$v_f = v_i + a\Delta t$
$v_f = 9,8 + (9,8)(2)$
$v_f = 29,4\ m\cdot s^{-1}$ ✓

✓Both /*Beide*



A-C

$\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$
$= (0)(3) + \frac{1}{2}(9,8)(3)^2$
$\Delta y = 44,1\ m$

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OPTION 3/*OPSIE 3*

A-C

$v_f^2 = v_i^2 + 2a\Delta y$ ✓
$v_f^2 = (0)^2 + (2)(9,8)(44,1)$ ✓
$v_f = 29,4\ m\cdot s^{-1}$ ✓

OPTION 4/*OPSIE 4*

A-C

$\Delta y = \left(\frac{v_i + v_f}{2}\right)\Delta t$ ✓
$44,1 = \left(\frac{0 + v_f}{2}\right)(3)$ ✓
$v_f = 29,4\ m\cdot s^{-1}$ ✓

A-B

$v_f = v_i + a\Delta t$
$= 0 + (9,8)(1)$
$v_f = 9,8\ m\cdot s^{-1}$

B-C

$\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$
$= (9,8)(2) + \frac{1}{2}(9,8)(2)^2$
$\Delta y = 39,2\ m$

OPTION 5/*OPSIE 5*

B-C

$v_f^2 = v_i^2 + 2a\Delta y$ ✓
$v_f^2 = (9,8)^2 + (2)(9,8)(39,2)$ ✓
$v_f = 29,4\ m\cdot s^{-1}$ ✓

OPTION 6/*OPSIE 6*

B-C

$\Delta y = \left(\frac{v_i + v_f}{2}\right)\Delta t$ ✓
$39,2 = \left(\frac{9,8 + v_f}{2}\right)(2)$ ✓
$v_f = 29,4\ m\cdot s^{-1}$ ✓

(3)

3.4.1

POSITIVE MARKING FROM QUESTION 3.2 and 3.3 ***POSITIEWE NASIEN VANAF VRAAG 3.2 en 3.3***	
Note/Let wel: If 9h = 44,1 m already calculated in 3.2 or 3.3, award 2 marks for answer./*Indien h = 44,1 m alreeds in 3.2 of 3.3 bereken, ken 2 punte toe vir antwoord.*	
UPWARDS AS POSITIVE/*OPWAARTS AS POSITIEF*	
OPTION 1/*OPSIE 1*	**OPTION 2/*OPSIE 2***
h = 4,9 9h = 9(4,9) ✓ = 44,1 m✓	$\Delta y = 4,9 + 39,2$ ✓ = 44,1 m✓
OPTION 3/*OPSIE 3*	**OPTION 4/*OPSIE 4***
$\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$ $= (0)(3) + \frac{1}{2}(-9,8)(3)^2$ ✓ $\Delta y = -44,1$ $\Delta y = 44,1$ m ✓	$\Delta y = \left(\frac{v_i + v_f}{2}\right)\Delta t$ $= \left(\frac{0 + -29,4}{2}\right)(3)$ ✓ $\Delta y = -44,1$ m $\Delta y = 44,1$ m ✓
OPTION 5/*OPSIE 5*	**OPTION 6/*OPSIE 6***
$-h = -4,9\Delta t^2$ $h = (4,9)(1)^2$ = 4,9 9h = 9(4,9) ✓ = 44,1 m✓	$\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$ $-h = \underline{(0) + \frac{1}{2}(-9,8)(1)^2}$ h = 4,9 9h = 9(4,9) ✓ = 44,1 m✓
OPTION 7/*OPSIE 7*	**OPTION 8/*OPSIE 8***
$\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$ $= \underline{(0)(3) + \frac{1}{2}(-9,8)(3)^2}$ ✓ $\Delta y = -44,1$ $\Delta y = 44,1$ m✓	$v_f^2 = v_i^2 + 2a\Delta y$ $\underline{(-29,4)^2 = (0)^2 + (2)(-9,8)\Delta y}$ ✓ $\Delta y = -44,1$ $\Delta y = 44,1$ m✓

DOWNWARDS AS POSITIVE/*AFWAARTS AS POSITIEF*	
OPTION 1/*OPSIE 1*	**OPTION 2/*OPSIE 2***
h = 4,9 9h = 9(4,9) ✓ = 44,1 m✓	$\Delta y = 4,9 + 39,2$ ✓ = 44,1 m✓
OPTION 3/*OPSIE 3*	**OPTION 4/*OPSIE 4***
$\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$ $= (0)(3) + \frac{1}{2}(9,8)(3)^2$ ✓ $\Delta y = 44,1$ m ✓	$\Delta y = \left(\frac{v_i + v_f}{2}\right)\Delta t$ $= \left(\frac{0 + 29,4}{2}\right)(3)$ ✓ $\Delta y = 44,1$ m ✓
OPTION 5/*OPSIE 5*	**OPTION 6/*OPSIE 6***
$h = (4,9)(1)^2$ = 4,9 9h = 9(4,9) ✓ = 44,1 m✓	$\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$ $h = \underline{(0) + \frac{1}{2}(9,8)(1)^2}$ h = 4,9 9h = 9(4,9) ✓ = 44,1 m✓
OPTION 7/*OPSIE 7*	**OPTION 8/*OPSIE 8***
$\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$ $= \underline{(0)(3) + \frac{1}{2}(9,8)(3)^2}$ ✓ $\Delta y = 44,1$ m✓	$v_f^2 = v_i^2 + 2a\Delta y$ $\underline{(29,4)^2 = (0)^2 + (2)(9,8)\Delta y}$ ✓ $\Delta y = 44,1$ m✓

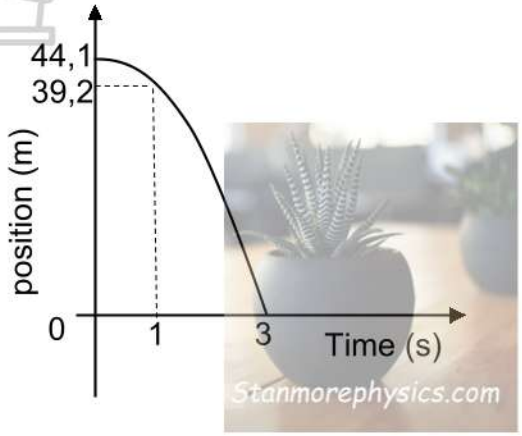
(2)

Stanmorephysics.com

3.4.2 $\Delta y_{BC} = 39,2$ m✓ (1)

3.5 **POSITIVE MARKING FROM QUESTIONS 3.3 and 3.4**
POSITIEWE NASIEN VANAF VRAAG 3.3 en 3.4

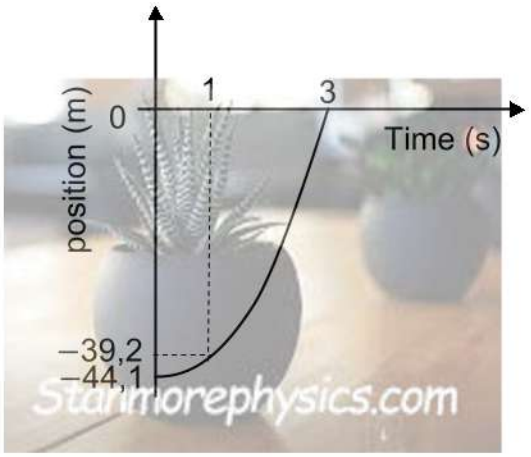
UPWARDS AS POSITIVE/*OPWAARTS AS POSITIEF*



Marking criteria:
- Initial position 44,1 m ✓
- Ball strikes the ground at 3 s ✓
- Position at 1s is 39,2 m✓
- Shape✓

Nasienkriteria:
- *Aanvanklike posisie 44,1 m* ✓
- *Bal tref die grond by 3 s* ✓
- *Posisie na 1s is 39,2 m*✓
- *Vorm*✓

DOWNWARDS AS POSITIVE/*AFWAARTS AS POSITIEF*



Marking criteria:
- Initial position −44,1 m ✓
- Ball strikes the ground at 3 s ✓
- Position after 1s is −39,2 m✓
- Shape✓

Nasienkriteria:
- *Aanvanklike posisie −44,1 m* ✓
- *Bal tref die grond by 3 s* ✓
- *Posisie na 1s is −39,2 m*✓
- *Vorm*✓

(4)
[16]

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.*
IF: closed system -1 mark
INDIEN: geslote sisteem – 1 punt

The total (linear) momentum in an isolated system is conserved/remains constant. ✓✓
Die totale (lineêre) momentum in 'n geïsoleerde sisteem bly behoue/konstant.

Accept for 1 mark/*Aanvaar vir 1 punt*
In a isolated system the total momentum before a collision is equal to the total momentum after a collision. ✓
In 'n geïsoleerde sisteem is die totale momentum voor 'n botsing gelyk aan die totale momentum na 'n botsing.

(2)

4.2

$\Delta x = v\Delta t$
$0,8 = v_i(2)$ ✓
$v_i = 0,4\ m\cdot s^{-1}$

RIGHT AS +/*REGS AS +*	**LEFT AS +/*LINKS AS +***
OPTION 1/*OPSIE 1*	
$\sum p_i = \sum p_f$ $m_1v_{1i} + m_2v_{2i} = m_1v_{1f} + m_2v_{2f}$ $m_1v_{1i} + m_2v_{i2} = (m_1 + m_2)v_f$ } ✓Any one/*Enige een* $(2)v_{i1} + 0$ ✓ $= (2 + 1,5)(0,4)$✓ $v_{i1} = 0,7\ m\cdot s^{-1}$ ✓	$\sum p_i = \sum p_f$ $m_1v_{1i} + m_2v_{2i} = m_1v_{1f} + m_2v_{2f}$ $m_1v_{1i} + m_2v_{i2} = (m_1 + m_2)v_f$ } ✓Any one/*Enige een* $(2)(-v_{1i}) + 0$ ✓$= (2 + 1,5)(-0,4)$✓ $v_{1i} = 0,7\ m\cdot s^{-1}$ ✓
OPTION 2 /*OPSIE 2*	
$\Delta p_1 = -\Delta p_2$ $m(v_{1f} - v_{1i}) = -m(v_{2f} - v_{2i})$ } ✓Any one/*Enige een* $2(0,4 - v_{1i})$ ✓$= -1,5(0,4 - 0)$ ✓ $v_{1i} = 0,7\ m\cdot s^{-1}$ ✓	$-\Delta p_1 = \Delta p_2$ $-m(v_{1f} - v_{1i}) = m(v_{2f} - v_{2i})$ } ✓Any one/*Enige een* $-2(0,4 - v_{1i})$ ✓$= 1,5(-0,4 - 0)$ ✓ $v_{1i} = 0,7\ m\cdot s^{-1}$ ✓

(5)

4.3 Inelastic / *Onelasties*✓ (1)

4.4 INCREASES/*NEEM TOE* ✓
$F_{net}\Delta t = \Delta p$ **OR/*OF*** $F_{net} = \frac{\Delta p}{\Delta t}$ **OR/*OF*** $F_{net}\Delta t = m\Delta v$ ✓ (2)

[10]

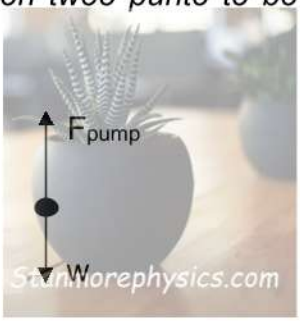
QUESTION 5/*VRAAG 5*

5.1

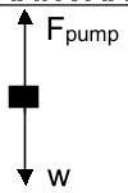
Marking criteria/*Nasienkriteria*
If any of the underlined key words/phrases in the **correct context** is omitted deduct 1 mark./*Indien enige van die onderstreepte sleutelwoorde/frases in die **korrekte konteks** uitgelaat is, trek 1 punt af.* **IF:** The word 'work' is omitted - 0 marks. ***INDIEN**: Die woord 'arbeid' uitgelaat is - 0 punte.*

A *non-conservative force* is a force for which the work done (in moving an object between two points) is dependent on the path taken. ✓✓
'n Nie-konserwatiewe krag is 'n krag waarvoor die arbeid wat verrig is (om 'n voorwerp tussen twee punte te beweeg) afhanklik is van die pad wat gevat word. (2)

5.2



ACCEPT/*AANVAAR*



	Accepted labels/*Aanvaarde benoemings*
F_{pump}	$F/F_P/F_{electric\ pump}$/*F/F_p/F_{electrisie pomp}*
w	F_g/F_w/weight/mg/gravitational force/*F_g/F_w*/*gewig*/*mg*/*gravitasiekrag*

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* $^1/_2$
- Any other additional force(s)/*Enige ander addisionele krag(te): Max/Maks* $^1/_2$
- If everything correct, but no arrows/*Indien alles korrek, maar geen pyltjies*: Max/*Maks* $^1/_2$ (2)

5.3.1

OPTION 1/*OPSIE 1*	**OPTION 2/*OPSIE 2***
$W_{nc} = \Delta E_p + \Delta E_k$ } ✓Any one/ *Enige een* $W_{pump} = mg\Delta h$ / mgh } $= 200(9,8)(12,5)$ $= 24\ 500$ J✓	$W = F\Delta x\cos\theta$ ✓ $= (1960)(12,5)(1)$ ✓ $= 24\ 500$ J✓

(3)

5.3.2

$$v = \frac{\Delta x}{\Delta t}$$
$$= \frac{12,5}{80} \checkmark$$
$$= 0,16\ m\cdot s^{-1}\ (0,156\ m\cdot s^{-1}) \checkmark$$

(3)

5.3.3

+ MARKING FROM Q 5.3.1 / *+NASIEN VANAF V* 5.3.1	**+ MARKING FROM Q 5.3.2 / *+NASIEN VANAF V* 5.3.2**
OPTION 1/*OPSIE 1*	**OPTION 2/*OPSIE 2***
$P_{ave} = \frac{W_{pump}}{\Delta t}$ ✓ $= \frac{24500}{80}$ OR $\frac{306,25}{1}$ ✓ $= 306,25$ W✓	$P_{ave} = F_{ave}v$ ✓ $= (200)(9,8)(0,16)$ ✓ $= 313,60$ W (305,76 W) ✓

(3)
[13]

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.*

Doppler effect/ Doppler effek✓

The change in frequency (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 (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). (3)

6.2

$v = f_L \lambda$

$340 = f_L \times 0{,}016$ ✓

$f_L = 21250$ Hz

$f_L = \frac{v \pm v_L}{v \pm v_S} f_S$ ✓ **OR/*OF*** $f_L = \frac{v}{v - v_S} f_S$ **OR/*OF*** $f_L = \frac{v \pm v_L}{v \pm v_B} f_S$

21250 ✓ $= \left(\frac{340}{340 - v_B}\right)$ ✓ f_S

$f_S = 21250 - 62{,}5v_B$

(4)

6.3

$f_L' = 21250 - 62{,}5v_B + 850$
$= 22100 - 62{,}5\ v_B$ ✓Any one/*Enige een*

$f_L' = \frac{v \pm v_L}{v \pm v_S} f_S$ **OR/*OF*** $f_L' = \frac{v + v_L}{v} f_S$

$[22100-(62{,}5)v_B]$ ✓ $= \frac{340 + v_B}{340}$ ✓ (21250) ✓

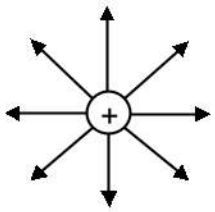
$v_B = 6{,}8\ m \cdot s^{-1}$ ✓

NOTE/*NOTA*:
f_L' is the frequency detected by the bat after reflection off the cliff.
f_L' is die frekwensie waargeneem deur die vlermuis na weerkaatsing vanaf die krans

(5)
[12]

QUESTION 7/*VRAAG 7*

7.1



Criteria for sketch/*Kriteria vir skets:*	
Sphere with no field lines inside./*Sfeer met geen veldlyne binne-in.*	✓
Correct shape./*Korrekte vorm.*	✓
Correct direction away from the charge./*Korrekte rigting weg van die lading.*	✓
Notes/*Aantekeninge*: If electric field lines cross or touch/*Indien elektriese veldlyne kruis of raak*: Max/*Maks* $^{2}/_{3}$	

(3)

7.2.1

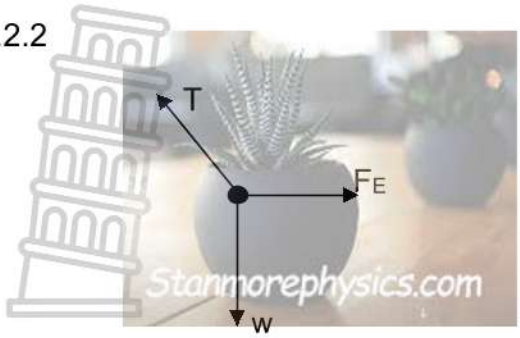
Marking criteria/*Nasienkriteria:*
If any of the underlined key words/phrases in the correct context are omitted:
- 1 mark per word/phrase.
Indien enige van die sleutelwoorde/frases in die korrekte konteks weggelaat word:
- 1 punt per word/frase.

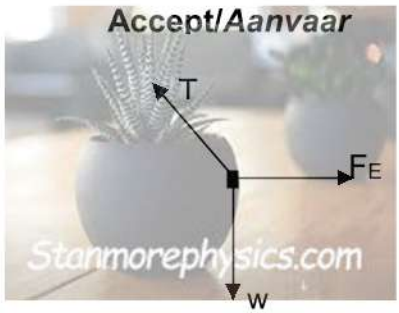
The magnitude of the electrostatic force exerted by one point charge (Q_1) on another point charge (Q_2) is directly proportional to the product of the (magnitudes) of the charges ✓ and inversely proportional to the square of the distance (r) between them. ✓
Die grootte van die elektrostatiese krag wat een puntlading (Q_1) *op 'n ander puntlading* (Q_2) *uitoefen, is direk eweredig aan die produk van die ladings en omgekeerd eweredig aan die kwadraat van die afstand (r) tussen hulle.*
OR/*OF*
The magnitude of the electrostatic force exerted by one charge (Q_1) on another charge (Q_2) is directly proportional to the product of the (magnitudes) of the charges ✓ and inversely proportional to the square of the distance (r) between their centres. ✓
Die grootte van die elektrostatiese krag wat een lading (Q_1) *op 'n ander lading* (Q_2) *uitoefen, is direk eweredig aan die produk van die ladings en omgekeerd eweredig aan die kwadraat van die afstand (r) tussen hulle middelpunte.*

NOTE: If masses are mentioned instead of charges: $^{0}/_{2}$ ***LET WEL: Indien massas in pleks van ladings genoem word:*** $^{0}/_{2}$

(2)

7.2.2





Accepted labels/*Aanvaarde byskrifte*	
w ✓	F_w/F_g/mg/1,47 x 10^{-3} N/gravitational force/*gravitasiekrag*/weight/*gewig*
F_E ✓	F/Electrostatic force/Coulomb force/$F_{E\ Field}$/$F_{P\ on\ S}$ / F_{Eveld}/$F_{P\ op\ S}$ *Elektrostatiese krag/Coulomb-krag*
T ✓	F_T/F_{string}/tension/*spanning*/F_{tou}

Notes/*Aantekeninge:*

- Mark awarded for label and arrow./*Punt toegeken vir benoeming en pyltjie.*
- Do not penalise for length of arrows since drawing is not to scale./*Moenie vir die lengte van die pyltjies penaliseer nie aangesien die tekening nie volgens skaal is nie.*
- Any other additional force(s)/*Enige ander addisionele krag(te):* *Max/Maks* $^2/_3$
- If everything is correct, but no arrows/*Indien alles korrek is, maar geen pyltjies*: Max/*Maks* $^2/_3$
- If force(s) do not make contact with the dot /Indien krag(te) nie met die kolletjie kontak maak nie: Max/Maks $^2/_3$

(3)

7.2.3

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

$$= \frac{\left(9 \times 10^{9}\right)\left(6 \times 10^{-9}\right)\left(3 \times 10^{-9}\right)}{0{,}03^2} \checkmark$$

✓or/*of*

$$= 1{,}80 \times 10^{-4}\ \text{N}$$

$$w = mg$$

$$= (1{,}5 \times 10^{-4})(9{,}8) \checkmark$$

$$= 1{,}47 \times 10^{-3}\ \text{N}$$

$$\tan\theta = \frac{F_E}{mg}$$

$$= \frac{1{,}8 \times 10^{-4}}{1{,}47 \times 10^{-3}} \checkmark$$

$$\theta = 7° \checkmark$$

(5)

[13]

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 potential difference (voltage) across a conductor is directly proportional to the current in the conductor at constant temperature. ✓✓
Die potensiaalverskil (spanning) oor 'n geleier is direk eweredig aan die stroom in die geleier by konstante temperatuur.
OR/*OF*
The current in a conductor is directly proportional to the potential difference (voltage) across the conductor if the temperature is constant. ✓✓
Die stroom in 'n geleier is direk eweredig aan die potensiaalverskil (spanning) oor die geleier indien die temperatuur konstant is.
OR/*OF*
The ratio of potential difference to current for a conductor is constant provided the temperature is constant. ✓✓
Die verhouding van potensiaalverskil tot stroom vir 'n geleier is konstant indien die temperatuur konstant bly. (2)

8.2.1

OPTION /*OPSIE 1*

$V_p = V_L$
$0,8(13)$ ✓$= I_L(9,5)$ ✓
$I_L = 1,09$ A ✓

OPTION 2/*OPSIE 2*

$I_{R_L} = I_{R_{13}}\left(\frac{R_{13}}{R_L}\right)$

$I_{R_L} = (0,8)$ ✓$\left(\frac{13}{9,5}\right)$ ✓

$= 1,09$ A ✓

(3)

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

OPTION /*OPSIE 1*

$V_p = V_{9\Omega}$
$10,40$✓$= I_{9\Omega}(9)$ ✓
$I_{9\Omega} = 1,16$ A

OR/*OF*

$V_p = V_{9\Omega}$
$I_1 R_{13} = I_{9\Omega}R_{9\Omega}$
$(0,8)(13)$ ✓$= I_{9\Omega}(9)$ ✓
$I_{9\Omega} = 1,16$ A

OPTION 2/*OPSIE 2*

$I_{R_{9\Omega}} = I_{R_{13}}\left(\frac{R_{13}}{R_9}\right)$ ✓

$I_{R_{9\Omega}} = (0,8)\left(\frac{13}{9}\right)$ ✓

$= 1,16$ A

$I_{total} = I_{13\Omega} + I_L + I_{9\Omega}$
$= 0,8 + 1,09 + 1,16$✓
$= 3,05$ A ✓

(4)

8.2.3 **POSITIVE MARKING FROM QUESTION 8.2.2. /**
POSITIEWE NASIEN VANAF VRAAG 8.2.2.

OPTION 1/*OPSIE 1*

$\varepsilon = V_{ext} + V_{int}$ ✓
$= V_{ext} + Ir$
$24 = V_{ext} + 3,05(0,3)$ ✓
$V_{ext} = 23,09$ V

$V_{ext} = V_p + V_R$
$23,09 = 10,40 + V_R$ ✓
$V_R = 12,69$ V

$V = IR$
$12,69 = (3,05)R$ ✓
$R = 4,16\ \Omega$ ✓

(Range: 4,159 Ω – 4,161 Ω)

OPTION 2/*OPSIE 2*

$R_{p1} = \left(\frac{R_1 R_2}{R_1 + R_2}\right)$ **OR/OF** $\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$

$= \frac{13 \times 9,5}{13 + 9,5}$

$R_{p1} = 5,49\ \Omega$

$R_{p2} = \frac{5,49 \times 9}{5,49 + 9}$ ✓

$R_{p1} = 3,41\ \Omega$

$\frac{1}{R_p} = \frac{1}{13} + \frac{1}{9,5} + \frac{1}{9}$ ✓

$R_p = 3,41\ \Omega$

$\varepsilon = I(R + r)$ ✓
$24 = 3,05(R_{ext} + 0,3)$ ✓
$R_{ext} = 7,57\ \Omega$

$R_{ext} = R_p + R$
$7,57 = 3,41 + R$ ✓
$R = 4,16\ \Omega$ ✓

(5)

8.3 Decreases/*Neem af* ✓
The total resistance increases✓/*Totale weerstand neem toe* (2)

8.4 Increases/*Neem toe*✓
V_{Lost} decreases V_R decreases ✓thus V_L larger✓/$V_{verlore}$ *neem af,* V_R *neem af,* V_L *neem toe*

R_L constant/*konstant* and/*en* $P = \frac{V^2}{R}$ ✓ therefore L is brighter/*daarom is L helderder*
OR/OF
V_{Lost} decreases V_R decreases ✓thus V_L larger✓/$V_{verlore}$ *neem af,* V_R *neem af,* V_L *neem toe*
I_L increases/*neem toe*
R_L constant/*konstant* and/*en* $P = I^2R$✓ therefore L is brighter/*daarom is L helderder* (4)

8.5 C✓, D✓ and/*en* F✓ OR/*OF* A_1, A_2 and $V_{9\ \Omega}$ (3)
[23]

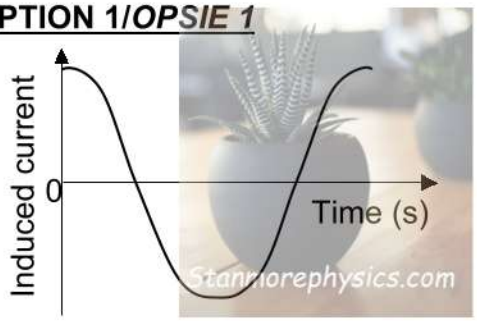
QUESTION 9/*VRAAG 9*

9.1.1 North/*Noord* ✓✓ (2)

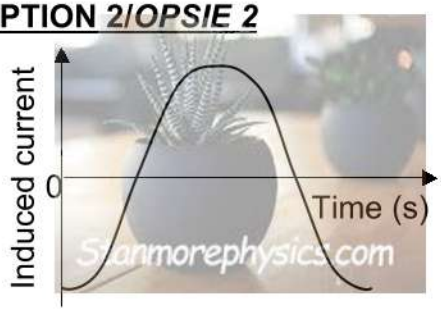
9.1.2 **ANY ONE** of the following./***ENIGE EEN****van die volgende*

- Increase speed of the rotation✓/*Verhoog spoed van rotasie*
- Increase number of coils (turns) ✓/*Meer windings*
- Use stronger magnet/ curved magnets/electromagnets/insert soft iron core/*Gebruik sterker magnet/geboë magnet/elektromagneet/voeg sagte ysterkern by* (1)

9.1.3 **OPTION 1/*OPSIE 1***



OPTION 2/*OPSIE 2*



Criteria for graph/*Kriteria vir grafiek*	
Graph starts with maximum current/ *Grafiek begin met maksimum stroom.*	✓
Graph drawn for one cycle/one complete wavelength./ *Grafiek geteken vir een siklus/een volledige golflengte.*	✓
Correct shape (cosine graph)./Korrekte vorm (cosinus grafiek)	✓

(3)

9.2.1

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.*

Root-mean-square current is the alternating current (AC) that dissipates the same amount of energy/heating effect as an equivalent direct current (DC) current. ✓✓
Die wortelgemiddeldekwadraat-stroom is die wisselstroom (WS) wat dieselfde hoeveelheid energie verbruik/verhittingseffek het as 'n ekwivalente gelykstroom (GS) het.

Note: If energy or heating effect is omitted: $^0/_2$
LET WEL: Indien energie of verhittingseffek uitgelaat is: $^0/_2$

(2)

9.2.2

OPTION 1/*OPSIE 1*

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

$= \left(\frac{340}{\sqrt{2}}\right)$ ✓

$= 240{,}42$ V

$P_{ave} = V_{rms}I_{rms}$ ✓

$1200 = (240{,}42)\, I_{rms}$ ✓

$I_{rms} = 4{,}99$ A ✓

OPTION 2/*OPSIE 2*

$P_{ave} = \frac{I_{max/maks} \times V_{max/maks}}{2}$

$1200 = \frac{I_{max/maks} \times 340}{2}$ ✓

$I_{max/maks} = 7{,}06$ A

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

$= \left(\frac{7{,}06}{\sqrt{2}}\right)$ ✓

$= 4{,}99$ A ✓

(4)

9.2.3 **POSITIVE MARKING FROM QUESTION 9.2.2 /**
POSITIEWE NASIEN VANAF VRAAG 9.4.1.

OPTION 1/*OPSIE 1*	**OPTION 2/*OPSIE 2***	**OPTION 3/*OPSIE 3***
$R = \frac{V_{rms}}{I_{rms}}$ ✓ $= \frac{240,42}{4,99}$ ✓ R = 48,18 Ω✓	$P_{ave} = I_{rms}^2R$ ✓ $1200 = (4,99)^2R$ ✓ R = 48,19 Ω✓	$P_{ave} = \frac{V_{rms}^2}{R}$ ✓ $1200 = \frac{240,42^2}{R}$ ✓ R = 48,17 Ω✓

(3)
[15]

QUESTION 10/*VRAAG 10*

10.1

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 minimum energy (of incident photons) that can eject electrons from a metal/surface. ✓✓
Die minimum energie (van invallende fotone) wat elektrone kan vrystel vanuit 'n metaal/oppervlak.

NOTE: If reference to frequency: $^0/_2$
LET WEL: Indien na frekwensie verwys word: $^0/_2$

(2)

10.2 1 ✓✓ (2)

10.3.1

$E_{k(max)} = \frac{1}{2}mv_{max}^2$ ✓
$2,99 \times 10^{-19} = \frac{1}{2}(9,11 \times 10^{-31})v_{max}^2$ ✓
$v_{max} = 8,10 \times 10^5\ m \cdot s^{-1}$ ✓

(3)

10.3.2

$E = W_0 + E_{k(max)}$
$hf = W_0 + E_{k(max)}$
✓ Any one/*Enige een*
$= 3,68 \times 10^{-19}$✓ $+ 2,99 \times 10^{-19}$ ✓
$E = 6,67 \times 10^{-19}$ (J) ✓

(4)

10.4 Remains the same/*Bly dieselfde*✓
The energy of the incident photons is not changing./*Die energie van die invallende fotone verander nie* ✓
OR/*OF*
Kinetic energy is affected by/depends on the frequency of the photons and the frequency remains the same✓/*Kinetiese energie word beïnvloed deur/ hang af van die frekwensie van die fotone.*

(2)
[13]

TOTAL/*TOTAAL*: 150

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