MARKING GUIDELINES / *NASIENRIGLYNE*

EXAMINATION *EKSAMEN*	**NATIONAL SENIOR CERTIFICATE** *NASIONALE SENIOR SERTIFIKAAT*
GRADE / *GRAAD*	12
DATE / *DATUM*	NOVEMBER 2025
SUBJECT / *VAK*	PHYSICAL SCIENCES / *FISIESE WETENSKAPPE*
PAPER / *VRAESTEL*	1
MARK TOTAL / *PUNTETOTAAL*	150
DURATION (HOURS) / *TYDSDUUR (UUR)*	3
NUMBER OF PAGES / *AANTAL BLADSYE*	18

SOUTH AFRICAN COMPREHENSIVE ASSESSMENT INSTITUTE

SUID-AFRIKAANSE KOMPREHENSIEWE ASSESSERINGSINSTITUUT

FINAL APPROVED MARKING GUIDELINES / *FINALE GOEDGEKEURDE NASIENRIGLYNE*	
DATE OF MEETING / *VERGADERINGSDATUM*	**12 November 2025**
UMALUSI MODERATOR / *UMALUSI-MODERATOR*	**Mbatha N.**
CHIEF MARKER / *HOOFMERKER*	
INTERNAL MODERATOR / *INTERNE MODERATOR*	

QUESTION/*VRAAG* 1

1.1 B ✓✓ (2)

1.2 B ✓✓ (2)

1.3 A ✓✓ (2)

1.4 D ✓✓ (2)

1.5 C ✓✓ (2)

1.6 D ✓✓ (2)

1.7 C ✓✓ (2)

1.8 B ✓✓ (2)

1.9 C ✓✓ (2)

1.10 C ✓✓ (2)

[20]

QUESTION/*VRAAG* 2

2.1 When one body (object A) exerts a force on a second body (object B), the second body (object B) exerts a force of equal magnitude in the opposite direction on the first body (object A). ✓✓

Wanneer een liggaam (voorwerp A) 'n krag op 'n tweede liggaam (voorwerp B) uitoefen, oefen die tweede liggaam (voorwerp B) 'n krag van gelyke grootte in die teenoorgestelde rigting op die eerste liggaam (voorwerp A) uit. ✓✓ (2)

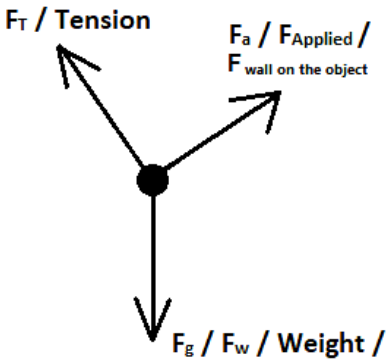
2.2
- T_1 – Force (tension) of the object on the pulley and the pulley on the object.
- T_2 – Force (tension) of the object on the pulley and the pulley on the object.
- Force of the box on the slope and the slope on the box.
- Force of the object on the wall and the wall on the object.
- Normal force applied on the pulley by the rope and the rope on the pulley.

(Consider learner responses) (Any one pair ✓)

- *T_1 – Krag (spanning) van die voorwerp op die katrol en die katrol op die voorwerp.*
- *T_2 – Krag (spanning) van die voorwerp op die katrol en die katrol op die voorwerp.*
- *Krag van die boks op die helling en die helling op die boks.*
- *Krag van die voorwerp op die muur en die muur op die voorwerp.*
- *Normale krag wat deur die katrol op die tou toegepas word en die krag wat die deur tou op die katrol toegepas word.*

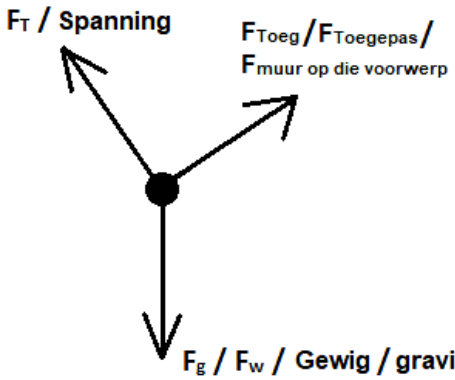
(Oorweeg leerder se antwoorde) *(Enige een paar ✓)* (1)

2.3



One mark per force
- F_g ✓
- F_T ✓
- $F_{wall\ on\ the\ object}$ ✓

– 1 for extra forces
– 1 for no arrows
– 1 for not touching the arrows or the origin



Een punt per krag
- F_g ✓
- F_T ✓
- $F_{muur\ op\ die\ voorwerp}$ ✓

– *1 vir ekstra kragte*
– *1 vir geen pyltjies nie*
– *1 Raak nie aan die pyltjies of die oorsprong nie*

(3)

2.4

HORIZONTAL/HORISONTAAL		**VERTICAL/VERTIKAAL**	
$F_{net} = 0$		$F_{net} = 0$	
$T_{1x} - F_x = 0$	✓ F (any)	$F_y + T_{1y} - F_g = 0$	✓ F (any)
$T_{1x} = F\sin\theta$		$T_{1y} = mg - F\cos\theta$	
$T_{1x} = 150\sin63^o$ ✓		$T_{1y} = (80)(9,8) - (150\cos63^o)$ ✓	
$T_{1x} = 133,65$ N		$T_{1y} = 715,90$ N	

Pythagoras

$T_1^2 = T_{1x}^2 + T_{1y}^2$ ✓m (any)

$T_1^2 = (133,65)^2 + (715,90)^2$

$T_1 = 728,27$ N ✓ (6)

Positive/*Positief*

2.5 The force that opposes the motion of an object ✓ and which acts parallel to the surface. ✓

Die krag wat die beweging van 'n voorwerp teenstaan en ✓ wat parallel met die oppervlak optree. ✓ (2)

2.6 $T_1 = T_2 =$ **728,27** N ✓ (1)

2.7 $T_2 - F_f - F_{g//} = 0$

$T_2 = F_f + F_{g//}$ ✓ F (any)

$T_2 = \mu mg\cos\theta + mg\sin\theta$

728,27 = (0,02)m(9,8)cos25° ✓ + m(9,8)sin25° ✓

728,27 = (0,178)m + (4,142)m

m = 168,58 kg ✓ (4)

[19]

QUESTION/*VRAAG* 3

3.1 $\Delta y = v_i\Delta t + \frac{1}{2}g\Delta t^2$ ✓

$(-3) = (0)\Delta t + \frac{1}{2}(-9,8)\Delta t^2$ ✓

$-4,9\Delta t^2 = -3$

$\Delta t = 0,78$ s ✓

$\therefore t = 0,78$ s

OR/*OF*

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

$v_f^2 = \underline{(0)^2} + \underline{2(-9,8)(-3)}$

$v_f^2 = 58,8$

$v_f = 7,67$ m.s^{-1}

$v_f = v_i + g\Delta t$ ✓ both/*beide*

$-7,67 = 0 + (-9,8)\,\Delta t$ ✓

$\Delta t = 0,78$ s ✓

$v_f^2 = v_i^2 + g\Delta y$
$v_f^2 = \underline{(0)^2} + \underline{(-9,8)(-3)}$
$v_f^2 = 29,4$
$v_f = 5,42$ m.s^{-1}

$v_f = v_i + g\Delta t$ ✓ both/*beide*
$-5,42 = 0 + (-9,8)\,\Delta t$ ✓
$\Delta t = 0,55$ s ✓

(3)

3.2 $\Delta y = v_i\Delta t + \frac{1}{2}g\Delta t^2$ ✓

$-4,5 = (0)\Delta t + \frac{1}{2}(-9,8)\Delta t^2$ ✓

$\therefore \Delta t = 0,96$ s ✓

OR/*OF*

$v_f = v_i + g\Delta t$ ✓

$0 = (5,42) + (-9,8)\,\Delta t$

$\Delta t = 0,55$ s

$t_2 = t_1 + 0,55$

$t_2 = 0,78 + 0,55$

$t_2 = 1,33$ s

$t_{DE} = \underline{2,29 - 1,33}$ ✓

$t_{DE} = 0,96$ s ✓

(3)

3.3 The <u>product</u> of the <u>resultant/net force</u> acting on an object and the <u>time</u> the resultant/net force <u>acts on the object</u>. ✓✓

Die <u>produk</u> van die <u>resultante/netto krag</u> wat op 'n voorwerp inwerk en die <u>tyd</u> wat die resultante/netto krag <u>op die voorwerp inwerk</u>. ✓✓

(2)

3.4 $F_{net} = \frac{\Delta p}{\Delta t}$

$F_{net} = \frac{mv_f - mv_i}{\Delta t}$

$F_{net} = \frac{m(v_f - v_i)}{\Delta t}$ ✓ F

$F_{net} = \frac{(0,1)[(6,26)-(-9,38)]}{(0,2)}$ ✓

$F_{net} = 7,83$ N ✓

$v_f^2 = v_i^2 + g\Delta y$
$v_f^2 = (5,42)^2 + (-9,8)(-3)$
$v_f^2 = 58,77$
$v_f = 7,67$ m.s^{-1}

$F_{net} = \frac{\Delta p}{\Delta t}$ ✓
$F_{net} = \frac{mv_f - mv_i}{\Delta t}$
$F_{net} = \frac{m(v_f - v_i)}{\Delta t}$
$F_{net} = \frac{(0,1)[(6,26)-(-7,67)]}{(0,2)}$ ✓
$F_{net} = 6,97$ N ✓

$v_f^2 = v_i^2 + g\Delta y$
$v_f^2 = \underline{(0)^2} + \underline{(-9,8)(-4,5)}$
$v_f^2 = 44,1$
$v_f = 6,64$ m.s^{-1}

$F_{net} = \frac{\Delta p}{\Delta t}$ ✓
$F_{net} = \frac{mv_f - mv_i}{\Delta t}$
$F_{net} = \frac{m(v_f - v_i)}{\Delta t}$
$F_{net} = \frac{(0,1)[(6,26)-(-6,64)]}{(0,2)}$ ✓
$F_{net} = 6,45$ N ✓

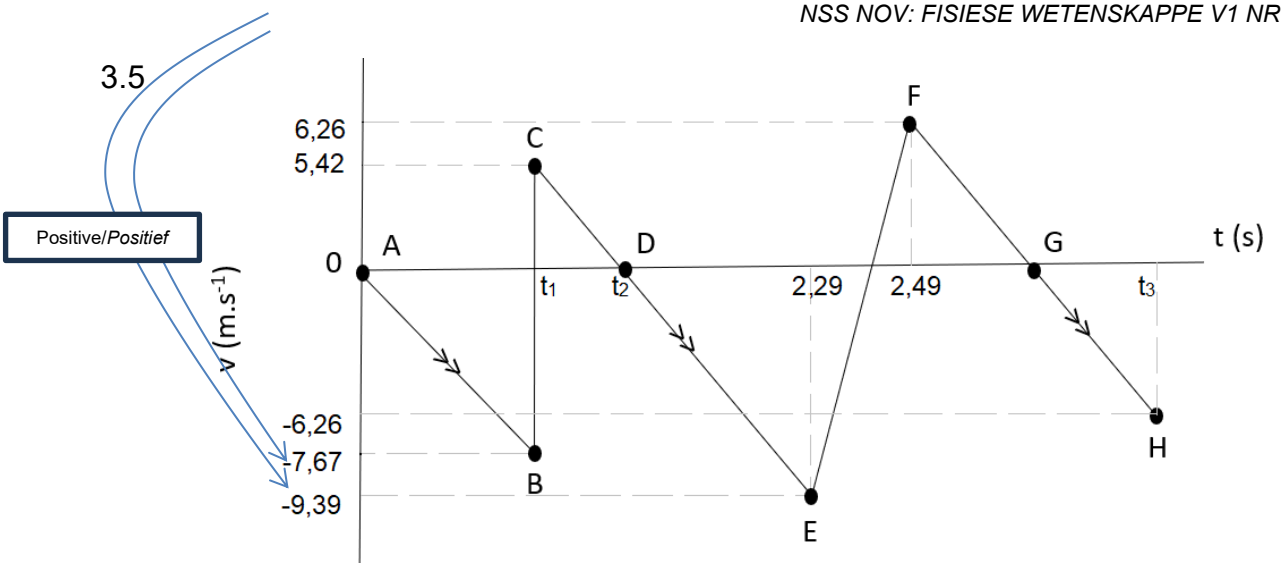
$v_f^2 = v_i^2 + 2g\Delta y$
$v_f^2 = (5,42)^2 + 2(-9,8)(-3)$
$v_f^2 = 88,18$
$v_f = \pm 9,38$ m.s^{-1}
$\therefore v_f = 9,38$ m.s^{-1}

OR/*OF*

$v_f^2 = v_i^2 + 2g\Delta y$
$v_f^2 = (0)^2 + 2(-9,8)(-4,5)$
$v_f^2 = 88,2$
$v_f = \pm 9,38$ m.s^{-1}
$\therefore v_f = 9,38$ m.s^{-1}

(3)

3.5



- Parallel lines ✓
- BC straight up ✓
- EF slightly diagonal ✓
- Significant velocity and time values are indicated ✓
  - 1 for headings & values

- Parallelle lyne ✓
- BC reguit opwaarts ✓
- EF effens diagonaal ✓
- Beduidende snelheids- en tydwaardes word aangedui ✓
  - 1 vir opskrifte en waardes

(4)

[15]

QUESTION/*VRAAG* 4

4.1 gradient = $\frac{\Delta y}{\Delta x}$ and/*en* $\Delta y = v_i\Delta t + \frac{1}{2} g\,\Delta t^2$ ($v_i = 0 m.s^{-1}$) ✓ formula/*formule*

$g = 2 \times \frac{\Delta y}{\Delta t^2}$ = 2 x gradient ✓

(Gravitational) acceleration is proportional to the gradient. (Show the link between the gradient and acceleration due to gravity)

(Gravitasie) versnelling is eweredig aan die gradiënt. (Wys die verband tussen die gradiënt en versnelling as gevolg van swaartekrag) (2)

4.2
- LOBF is <u>not straight line</u>/passes through all points.
- Time squared is related to time and is the dependent variable while height is the independent variable thus height should be on the horizontal axis.
- Points not in correct spot (last point).
- Inconsistent height scale near 0 m.
- Does not pass through the origin as logic would dictate.
- Does not extrapolate past the 1st and last points.
- No title.

(Consider learner responses) (Any three ✓✓✓) (3)

- *LVBP is <u>nie reguitlyn nie</u>/gaan deur alle punte.*
- *Tyd kwadraat hou verband met tyd en is die afhanklike veranderlike terwyl hoogte die onafhanklike veranderlike is, dus moet hoogte op die horisontale as wees.*
- *Punte is nie op die regte plek nie (laaste punt).*
- *Inkonsekwente hoogteskaal naby 0 m.*
- *Gaan nie deur die oorsprong soos logika sou bepaal nie.*
- *Ekstrapoleer nie verby die 1ste en laaste punte nie.*
- *Geen titel nie.*

(Oorweeg leerder se antwoorde) *(Enige drie ✓✓✓)* (3)

4.3 $\Delta y = v_i \Delta t + \frac{1}{2} g \Delta t^2$ ($v_i = 0$ m.s^{-1})

$-h = v_i \Delta t + \frac{1}{2} g \Delta t^2$

$h = -\frac{1}{2} g \Delta t^2$ ✓ m THUS/*DUS*: $\frac{h}{t^2} = -\frac{1}{2} g$

$y = mx + c$ (where/*waar*: $y = h$; $x = t^2$; $m = -½g$; $c = 0$)

$h = -\frac{1}{2} g \Delta t^2 + 0$

$h = -\frac{1}{2} g \Delta t^2$ THUS/*DUS*: $\frac{h}{t^2} = -\frac{1}{2} g$

Gradient = $\frac{h}{t^2}$

Gradient = $-\frac{1}{2} g$

$4{,}88 = -\frac{1}{2} g$ ✓

$g = 9{,}76$ m.s^{-2} ✓ (3)

[8]

QUESTION/*VRAAG 5*

5.1 $E_{m\ (bottom/onder)} = E_p + E_k$

$E_{m\ (bottom/onder)} = mgh + \frac{1}{2}mv^2$ ✓ F (any)

$E_{m\ (bottom/onder)} = (2)(9,8)(0) + \frac{1}{2}(2)(6)^2$ ✓

$E_{m\ (bottom/onder)} = 36$ J ✓ (3)

5.2 $E_{m\ (top/bo)} = E_{m\ (bottom/onder)}$

$E_p + E_k = E_{m\ (bottom/onder)}$ ✓ F(any)

$mgh + \frac{1}{2}mv^2 = E_{m\ (bottom/onder)}$

Positive/*Positief*

$(2)(9,8)h + \frac{1}{2}(2)(0)^2 = 36$ ✓

$h = 1,84$ m ✓ (3)

5.3 The total (linear) momentum of an isolated system remains constant (is conserved). ✓✓

Die totale (lineêre) momentum van 'n geïsoleerde stelsel bly konstant (word behou). ✓✓ (2)

5.4 $\Sigma p_i = \Sigma p_f$

$mv_{xi} + mv_{yi} = mv_{xf} + mv_{yf}$ ✓ F(any)

$(2)(6) + (3)(0)$ ✓ $= (2)(-2) + (3)v_{yf}$ ✓

$v_{yf} = 5,33$ m.s^{-1} Right/*regs*/Forward/*vorentoe* ✓ (4)

5.5 $\sin 30° = \frac{1,2}{\text{distance of slope/afstand van helling}}$ THUS, distance of slope = 2,4 m

DUS, lengte van helling = 2,4 m

Positive/*Positief*

Positive/*Positief*

$W_{nc/nk} = \Delta E_m$

$W_f = E_{mf} - E_{mi}$ ✓F (any)

$F_f x \cos\theta = E_{mf} - E_{mi}$

$F_f(2,4)\cos 180° \checkmark = \left[\frac{1}{2}(3)(0,15)^2 + (3)(9,8)(1.2)\right] \checkmark - \left[\frac{1}{2}(3)(5.33)^2 + (3)(9,8)(0)\right] \checkmark$

$F_f = 3,07$ N ✓

OR/*OF*

$W_{net} = \Delta E_k$

$W_{g//} + W_f = \Delta E_k$ ✓F (any)

$mg\sin\theta x\cos\theta + F_f x\cos\theta = \frac{1}{2}m(v_f^2 - v_i^2)$

$(3)(9,8)\sin 30°(2,4)\cos 180° \checkmark + F_f(2,4)\cos 180° \checkmark = \frac{1}{2}(3)\left[(0,15^2)-(5,33^2)\right] \checkmark$

$F_f = 3,07$ N ✓ (5)

OR/*OF*

$W_{nc} = \Delta E_k + \Delta E_p$

$W_f = \left[\frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2\right] + [mgh_f - mgh_i]$ ✓F (any)

$F_f(2,4)\cos 180° \checkmark = \left[\frac{1}{2}(3)(0,15)^2 - \frac{1}{2}(3)(5.33)^2\right] \checkmark + [(3)(9,8)(1.2) + (3)(9,8)(0)] \checkmark$

$F_f = 3,04$ N ✓

5.6 $0,15\ m.s^{-1}$ ✓

No friction/external forces to slow it down/Geen wrywing/eksterne kragte om dit te vertraag nie. ✓ (2)

[19]

QUESTION/*VRAAG* 6

6.1 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 wat deur 'n luisteraar waargeneem word omdat die klankbron en die luisteraar verskillende snelhede het relatief tot die medium van klankverspreiding. ✓✓

OR/*OF*

Apparent change in frequency due to the relative motion between the sound source and the listener. ✓✓

Oënskynlike verandering in frekwensie as gevolg van die relatiewe beweging tussen die klankbron en die luisteraar. ✓✓ (2)

6.2
- As the jet moves away its relative motion is in the opposite direction to the wave propagation, causing the waves to spread out (become longer). ✓
- Frequency is inversely proportional to wavelength thus appears to decrease. ✓

- *Soos die straalvliegtuig wegbeweeg, is sy relatiewe beweging in die teenoorgestelde rigting van die golfuitstraling, wat veroorsaak dat die golwe versprei (langer word).* ✓
- *Frekwensie is omgekeerd eweredig aan golflengte en blyk dus om af te neem.* ✓ (2)

6.3 **Moving towards/*Beweeg nader***

$f_L = \frac{v + v_L}{v - v_s} f_s$ ✓ F (any/*enige*)

$\frac{f_L (v - v_s)}{(v + v_L)} = f_s$

$\frac{(20148,15)(340 - v_s)}{(340 + 0)} = f_s$ ✓

Moving away/*Beweeg weg*

$f_L = \frac{v + v_L}{v + v_s} f_s$

$\frac{f_L (v + v_s)}{(v + v_L)} = f_s$

$\frac{(2220,41)(340 + v_s)}{(340 + 0)} = f_s$ ✓

Accept/*Aanvaar* ✓
$f_L = \frac{v \pm v_L}{v \pm v_S} f_s$

$f_{s\ (towards/nader)} = f_{s\ (away/weg)}$

$\frac{(20148,15)(340 - v_s)}{\cancel{(340)}} = \frac{(2220,41)(340 + v_s)}{\cancel{(340)}}$ ✓ m

$\frac{(20148,15)(340 - v_s)}{(2220,41)} = (340 + v_s)$

$(9,074)(340 - v_s) = 340 + v_s$

$3085,16 - 9,074v_s = 340 + v_s$

$2745,16 = 10,074v_s$

$v_s = 272,50\ m.s^{-1}$ ✓ (5)

[9]

QUESTION/*VRAAG 7*

7.1 7.1.1 Each body in the universe attracts every other body with a force that is directly proportional to the product of their masses ✓ and inversely proportional to the square of the distance between their centres. ✓

Elke liggaam in die heelal trek elke ander liggaam aan met 'n krag wat direk eweredig is aan die produk van hul massas ✓ en omgekeerd eweredig is aan die kwadraat van die afstand tussen hul middelpunte. ✓ (2)

7.1.2 The (gravitational) force the Earth exerts on any object on or near its surface. ✓✓

Die (gravitasie)krag wat die Aarde op enige voorwerp op of naby sy oppervlak uitoefen. ✓✓ (2)

7.1.3 $F = \frac{GMm}{r^2}$ ✓ F

$F = \frac{(6{,}67 \times 10^{-11})(5{,}98 \times 10^{24})(800)}{(6{,}35 \times 10^{6} + 1{,}8 \times 10^{6})^2}$ ✓ ✓

$F = \frac{3{,}19 \times 10^{17}}{8150000^2}$

$F = 3{,}92 \times 10^{10}$ N ✓ (4)

7.2 $F_{net} = 0$

$F_{Q_y \text{ on/op } q} = F_{Q_z \text{ on/op } q}$

$\frac{kqQ_z}{r^2} = \frac{kqQ_y}{x^2}$

✓ Concept equilibrium

✓ $F_{coulomb}$

$x^2 = \left(\frac{Q_y}{Q_z}\right) r^2$

$x = r\sqrt{\frac{Q_y}{Q_z}}$

$x = (2)\sqrt{\frac{3}{5}}$ ✓

$x = 1{,}55$ cm ✓ (4)

[12]

QUESTION/*VRAAG* 8

8.1 The maximum energy provided by a battery per unit charge passing through it. ✓✓

Die maksimum energie wat deur 'n battery per eenheidslading verskaf word, wat daardeur gaan. ✓✓ (2)

8.2 $P = I^2_{4\Omega}R_{4\Omega}$ ✓ F

$I_{4\Omega} = \sqrt{P/R_{4\Omega}}$

$I_{4\Omega} = \sqrt{\frac{8}{4}}$ ✓

$I_{4\Omega} = 1{,}41$ A ✓ (3)

8.3 $\frac{1}{R_p} = \frac{1}{R_2 + R_3} + \frac{1}{R_{motor}}$ ✓ F

$\frac{1}{R_p} = \frac{1}{12+2} + \frac{1}{4}$ ✓

$\frac{1}{R_p} = \frac{9}{28}$

$R_p = \frac{28}{9}$

$R_p = 3{,}11\ \Omega$ ✓ (3)

8.4 $V_2 = IR_{motor}$ ✓

$V_2 = (1{,}41)(4)$ ✓

$V_2 = 5{,}64$ V ✓ (3)

8.5 $I_T = \frac{V_2}{R_p}$

$I_T = \frac{5{,}64}{3{,}11}$ ✓

$I_T = 1{,}81$ A ✓ (2)

8.6 $\varepsilon = I(R+r)$ ✓

$\varepsilon = I(R_p + R_1 + r)$

$24 = (1{,}81)(3{,}11 + R_1$ ✓ $+2)$ ✓

$R_1 = 8{,}14\ \Omega$ ✓ (4)

OR/OF 8.4

$P = \frac{V^2}{R}$ ✓

$8 = \frac{V^2}{4}$ ✓

$V = 5{,}66$ V ✓

OR/*OF 8.5*

$I = \frac{V_2}{R_2 + R_3}$

$I = \frac{5{,}64}{12 + 2}$

$I = 0{,}40$ A **THUS** $I_T = 0{,}40 + 1{,}41 = 1{,}81$ A

OR/*OF 8.6*

$V_\varepsilon = IR$ ✓ $R = R_p + R_1 + r$

$24 = (1{,}81)R$ $13{,}26 = 3{,}11 + R_1$ ✓ $+r+2$ ✓

$R = 13{,}26\ \Omega$ $R_1 = 8{,}14\ \Omega$ ✓

Positive/*Positief*

Positive/*Positief*

Positive/*Positief*

Positive/*Positief*

Positive/*Positief*

Positive/*Positief*

Positive c.o.e.

8.7 Cost = kwh x Price ✓

Cost = (0,008) ✓$_{conv}$ (12)(1,30) ✓

Cost = R0,12 ✓

Koste = kwh x Prys ✓

Koste = (0,008) ✓$_{omskakel}$ *(12)(1,30)* ✓

Koste = R0,12 ✓ (4)

8.8 INCREASES/*VERHOOG* ✓✓ (2)

[23]

QUESTION/*VRAAG* 9

9.1 Mechanical to electrical energy./*Meganiese tot elektriese energie.* ✓✓ (2)

9.2 SPLIT RINGS/*SPLITRINGE* ✓ (1)

9.3 S to/*na* T ✓ (1)

9.4 $I_{rms/wgk} = \frac{I_{max/maks}}{\sqrt{2}}$ ✓

$I_{rms/wgk} = \frac{4}{\sqrt{2}}$ ✓

$I_{rms/wgk} = 2,83$ A ✓ (3)

Positive/*Positief*

9.5 $P_{gem/ave} = V_{wgk/rms}\ I_{wgk/rms}$

$P_{gem/ave} = (240)(2,83)$

$P_{gem/ave} = 679,2$ W

$P_{gem/ave} = I_{rms/wgk}^2 R$

679,2 ✓ $= (2,83)^2 R$ ✓

R= 84,81 Ω ✓ (3)

[10]

OR/OF

$P_{gem/ave} = \frac{V_{wgk/rms}^2}{R}$

679,2 ✓ $= \frac{(240)^2}{R}$ ✓

R = 84,81 Ω ✓ ✓

OR/OF

$R = \frac{V_{max/maks}}{I_{max/maks}}$

$R = \frac{(240)\sqrt{2}}{4}$ ✓top ✓bottom

R = 84,85 Ω ✓

$P = I_{rms/wgk}^2 R$ ✓

$9 = (2,83)^2 R$ ✓

$R = \frac{9}{2,83^2}$

R= 1,13 Ω ✓

OR/OF

$P = \frac{V_{wgk/rms}^2}{R}$ ✓

$9 = \frac{240^2}{R}$ ✓

R = 6400 Ω ✓

QUESTION/*VRAAG* 10

10.1 The minimum energy that an electron in the metal needs to be emitted from the metal surface. ✓✓

Die minimum energie wat 'n elektron benodig in die metaal om van die metaaloppervlak af vrygestel te word. ✓✓ (2)

10.2 $\lambda = \frac{v}{f}$ ✓

$\lambda = \frac{3\times10^{8}}{7\times10^{14}}$ ✓

$\lambda = 4{,}29 \times 10^{-7}$ m ✓ **OR/*OF*** 428,57 nm

OF/OR

$W_0 = hf$

$W_0 = (6{,}63 \times 10^{-34})(7\times10^{14})$

$W_0 = 4{,}64 \times 10^{-19}$J ✓ F (both)

$W_0 = \frac{hc}{\lambda_0}$

$4{,}64 \times 10^{-19} = \frac{(6{,}63 \times 10^{-34})(3 \times 10^{8})}{\lambda}$ ✓

$\lambda = 4{,}29 \times 10^{-7}$ m ✓

(3)

10.3 Zinc ✓ and copper ✓ (-1 for every extra metal)

Sink ✓ en koper ✓ (-1 vir elke ekstra metaal) (2)

10.4 $W_0 = \frac{hc}{\lambda_0}$ ✓

$W_0 = \frac{(6{,}63 \times 10^{-34})(3 \times 10^{8})}{(540 \times 10^{-9})}$ ✓ ✓ conv/*omsk*

$W_0 = 3{,}68 \times 10^{-19}$ J ✓ (4)

10.5 10.5.1 INCREASES/*VERHOOG* ✓

Higher intensity result in more photons reaching the metal thus more electrons obtain sufficient energy to be emitted. ✓

Hoër intensiteit lei daartoe dat meer fotone die metaal bereik, dus kry meer elektrone voldoende energie om uitgestraal te word. ✓ (2)

10.5.2 DECREASES/*VERLAAG* ✓

Smaller surface area results in less place for photons to reach the electrons, thus less electrons are being emitted. ✓

Kleiner oppervlakte lei tot minder plek vir fotone om die elektrone te bereik, dus word minder elektrone vrygestel. ✓ (2)

[15]

GRAND TOTAL/*GROOTTOTAAL*: [150]