LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF EDUCATION

NATIONAL SENIOR CERTIFICATE

GRADE 12

ERRATA MARKING GUIDELINES/*ERRATA NASIENRIGLYNE*

PHYSICAL SCIENCES: PHYSICS (P1)

TRIAL 2026

MARKING GUIDELINE/ *NASIEN RIGLYNE*

MARKS: 150

These marking guidelines consist of 18 pages

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QUESTION/VRAAG 1

1.1 A✓✓

1.2 B✓✓

1.3 C✓✓

1.4 C✓✓

1.5 A ✓✓

1.6 A ✓✓

1.7 A ✓✓

1.8 C ✓✓

1.9 C ✓✓

1.10 C ✓✓

(2 x 10 =20)

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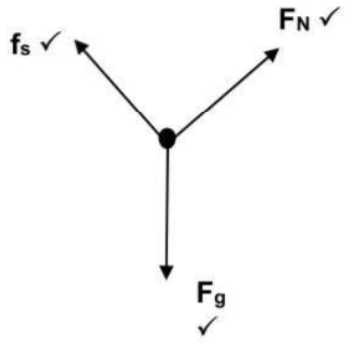
QUESTION/VRAAG 2

2.1 An object will remain in its state of rest or motion at constant velocity/ uniform motion in a straight line, unless a non-zero net/resultant force acts on it ✓✓

'n Voorwerp sal in 'n toestand van rus of konstante snelheid volhard tensy 'n nie-nul netto/resultante krag daarop inwerk. ✓✓

(2)

2.2



(3)

NOTE: DO NOT ALLOW f_k since object is stationary.

ACCEPTED SYMBOLS/AANVAARDE SIMBOLE		
f_s	Friction/ Static friction/F_f	*Wrywing*
F_g	w, weight/Gravitational force/ $F_{Earth\ on\ A}$	*Gewig/Gravitasiekrag/* $F_{Aarde\ op\ A}$
F_N	Normal force/ N	*Normaalkrag*
Notes: • Mark awarded for label and arrow • Do not penalize for length of arrows • Any additional force/s: -1 • If force(s) do not make contact with the body: -1 mark • -1 mark if all arrowheads are omitted but correctly labelled.		*Notas:* • *Punt toegeken vir pyl en pylpunt* • *Addisionele krag/te:-1* • *As kragte nie kontak maak met kol nie: -1* • *-1 punt as alle kragte teenwoordig is en benoem maar geen pylpunte nie.*
		(3)

2.3

$$F_{net\parallel} = 0$$

$$W_{\parallel} + (-f)_s = 0$$

$$mg\sin\theta - f_s = 0$$

$$\therefore f_s = mg\sin\theta$$

$$F_{net\perp} = 0$$

✓ Any one

$$F_N + (-F_{g_\perp}) = 0$$

$$F_N = F_{g_\perp}$$

$$F_N = mg\cos\theta$$

BUT: $f_{smax} = \mu_s F_N$✓

$$f_{smax} = \mu_s(mg\cos\theta)$$

$$f_{smax} = mg\sin\theta_{max}$$

$$F_N = mg\cos\theta_{max}$$

$$F_{g\parallel} = f_{smax}$$

$$mg\sin\theta_{max}\checkmark = \mu_s(mg\cos\theta_{max})\checkmark$$

$$\sin\theta_{max} = \mu_s\cos\theta_{max}$$

$$\mu_s = \frac{\sin\theta_{max}}{\cos\theta_{max}}$$

$$\mu_s = \tan\theta_{max}\ \checkmark$$

$$\theta_{max} = \tan^{-1}\mu_s$$

(5)

Marking criteria:

- Newton's first law (Fnet = 0)
- Formula for f_{smax} (Lose formula mark if max is omitted)
- Expanding for f_{smax}
- Expanding for $F_{g\parallel}$
- Substituting tanθ for $\frac{\sin\theta}{\cos\theta}$

OPTION 2

$F_{net}=ma$ ✓ Any one

$F_{g\parallel}-f_s^{max}=0$

$f_s^{max} = \mu_s F_N$ ✓

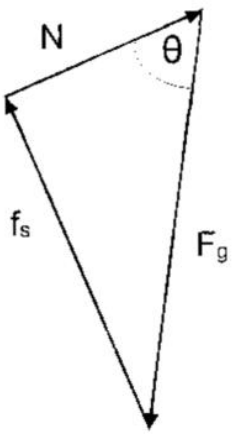
$mg\sin\theta_{max}$ ✓ $=\mu_s(mg\cos\theta_{max})$ ✓

$\sin\theta_{max}=\mu_s\cos\theta_{max}$

$\mu_s=\frac{\sin\theta_{max}}{\cos\theta_{max}}$

$\mu_s=\tan\theta_{max}$ ✓

$\theta_{max}=\tan^{-1}\mu_s$



OPTION 3: Using force diagram

$\tan\theta_{max}=\frac{f_s^{max}}{F_N}$ ✓✓

$f_s^{max} = \mu_s F_N$ ✓

$\tan\theta_{max}=\frac{\mu_s F_N}{F_N}$ ✓

$\mu_s=\tan\theta_{max}$ ✓

$\theta_{max}=\tan^{-1}\mu_s$

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2.4 Once the block is sliding, its acceleration is given by:

$F_{netx} = ma$
$F_{g\parallel} + (-f_k) = ma$
$mg\sin\theta - f_k = ma$
$mg\sin\theta - \mu_k F_N = ma$
$mg\sin\theta - \mu_k(mg\cos\theta)$ ✓ $= ma$
$g\sin\theta - \mu_k g\cos\theta = a$ ✓

✓ ANY ONE

$a = g\sin\theta - \mu_k g\cos\theta$
$a = g(\sin\theta - \mu_k\cos\theta)$ (3)

[13]

QUESTION/ VRAAG 3

3.1 Motion of an object under the influence of gravitatonal force only. ✓ ✓

Beweging waartydens die enigste krag wat op 'n voorwerp inwerk, die gravitasiekrag is.✓✓ (2)

3.2.1 Downwards as positive

$v_f = v_i + a\Delta t$ ✓
$v_i = -(v_i) + (9{,}8)(3{,}5)$ ✓
$v_i = 17{,}15\ m \cdot s^{-1}$
:. The speed is 17,15 m·s^{-1}✓

Upwards as positive

$v_f = v_i + a\Delta t$ ✓
$-v_i = (v_i) + (-9{,}8)(3{,}5)$ ✓
$v_i = -17{,}15\ m \cdot s^{-1}$
:. The speed is 17,15 m·s^{-1}✓

OPTION 2

$\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$ ✓
$0 = v_i(3{,}5) + \frac{1}{2}(9{,}8)(3{,}5)^2$ ✓
v_i = -17,15
= 17,15 m·s^{-1}✓

OPTION 3

$v_f = v_i + a\Delta t$ ✓
$0 = v_i + 9{,}8(1{,}75)$ ✓
v_i = -17,15 m·s^{-1}✓

OPTION 3

$v_f = v_i + a\Delta t$ ✓
$v_f = 0 + 9{,}8(1{,}75)$ ✓
v_i = 17,15 m·s^{-1}✓

(3)

3.2.2 **POSITIVE MARKING FROM QUESTION 3.2.1**

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

$\Delta y = (-17,15)(1,5) + \frac{1}{2}(9,8)(1,5)^2$ ✓

$\Delta y = -14,7$

Height at which they pass is 14,7 m above the ground.✓ (3)

3.2.3 **POSITIVE MARKING FROM QUESTION 3.2.2**

Calculate the distance that **A** travelled from rest in 1,5 seconds.

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

$= 0 + \frac{1}{2}(9,8)(1,5)^2$ ✓

= 11,025 m

Add to the height at which they passed each other:

Total height = 11,025 + 14,7 ✓ (14,7 is answer as obtained in Q 3.2.2)

= 25,725 m ✓ (25,73 m)

(4)

3.2.4 **POSITIVE MARKING FROM QUESTION 3.2.1**

OPTION 1

$v_f^2 = v_i^2 + 2a\Delta y$ ✓

$0 = (-17,15)^2 + 2(9,8)(\Delta y)$ ✓

Δy = -15,00625

Max height = 15,01 m ✓

OPTION 2

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

$\Delta y = (-17,15)(1,75) + \frac{1}{2}(9,8)(1,75)^2$ ✓

= -15,00625m

Max height = 15,00625m✓

OPTION 3

$\Delta y = v_f \Delta t - \frac{1}{2} a (\Delta t)^2$ ✓

$\Delta y = (0)(1,75) - \frac{1}{2}(9,8)(1,75)^2$ ✓

= -15,00625 m

Max height is 15,00625 m✓ (15,01 m)

OPTION 4

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

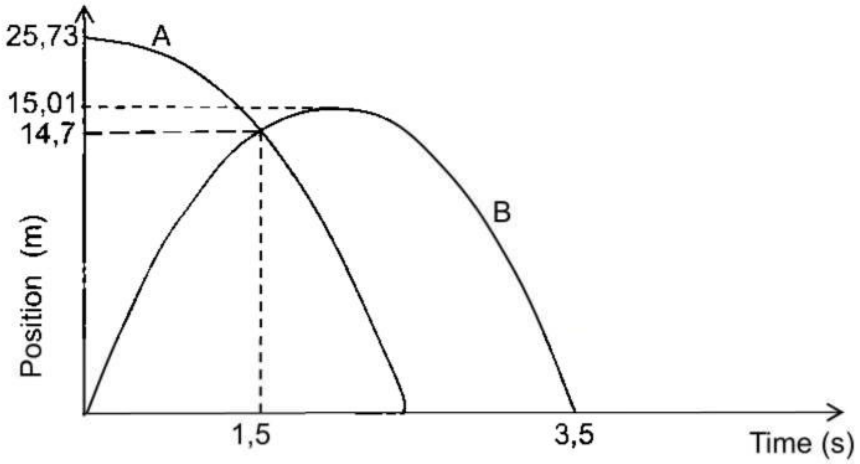
$\Delta y = \left(\frac{-17,15+0}{2}\right)(1,75)$ ✓

=-15,00625 m

Max height is 15,00625 m✓ (15,01 m)

(3)

3.3 **POSITIVE MARKING FROM QUESTIONS 3.2.1, 3.2.2. 3.2.3, 3.2.4**



Marking Criteria

* A: starting point and shape✓

* B shape and final time ✓

* time and height that A and B pass - before max height of B ✓

* B max height ✓

NOTE: If graphs are not labelled: 0/4

If drawn on two axis: max 3/4

(4)

QUESTION 4/ VRAAG 4

4.1 The net/resultant force acting on an object is equal to the rate of change of momentum of the object in the direction of the net force.✓✓

Die netto (of resulterende) krag wat op 'n voorwerp inwerk, is gelyk aan die tempo van verandering van momentum van die voorwerp in die rigting van die netto krag.✓✓

(2)

4.2. From/van $F_{net} = \frac{\Delta p}{\Delta t}$ ✓, accept Fnet Δt= Δp,

$F_{net} \alpha \frac{1}{\Delta t}$ for a constant change in momentum. ✓

Crumple zone increases the contact time and thus reduces the net force.✓

$F_{net} \alpha \frac{1}{\Delta t}$ *vir 'n konstante verandering in momentum..* ✓

Frommel zone verhoog die kontaktyd en daarom gaan netto krag afneem. ✓

OR

From/Van $F_{net} = \frac{\Delta p}{\Delta t}$ ✓,

Net force is inversely proportional to contact time if change in momentum is constant. ✓

Therefore, as the crumple zone increases the time for the vehicle to change momentum, the net force will decrease.✓

Netto krag is omgekeerd eweredig aan kontaktyd as verandering in momentum constant is.✓

Die frommelzone verhoog die kontaktyd en daarom gaan die netto krag afneem✓.

OR

$F_{net} = \frac{m\Delta v}{\Delta t}$ ✓

Net force is inversely proportional to contact time if change in velocity is constant ✓

Therefore as time increase, net force decrease.✓

(3)

4.3.1 Impulse = area under the graph

$= \frac{1}{2}bh$

$= \frac{1}{2}(1{,}85)(16500)$ ✓

Impulse = 15 262,5 N·s ✓

(2)

4.3.2

$$\left.\begin{aligned} \text{Impulse} &= \Delta p \\ \text{Area} &= m(v_f - v_i) \end{aligned}\right\} \checkmark \text{ any one}$$

$\frac{1}{2}(2{,}83)(-11850)\checkmark = m(0 - 15)\checkmark$

$m = 1117{,}85$ kg✓

(4)

QUESTION/VRAAG 5

5.1 A force for which the work done in moving an object between two points depends on the path taken. ✓✓**OR** A force for which the work done in moving an object around a closed path is non-zero.✓✓

'n Krag waarvoor die arbeid verrig om 'n voorwerp tussen twee punte te beweeg afhanklik is van die roete wat gevolg word.✓✓ (2)

5.2.1 **CD**

$W = f_k \Delta x \cos\theta$ ✓

$W = \underline{9,8294(2,4)(\cos 180)}$ ✓

$W = -23,59056\ J$ ✓

$f_k = \mu_k N$

$= \underline{(5,9)(9,8)(0,17)}$ ✓

$f_k = 9,8294$

Carry over

(4)

5.2.2 **POSITIVE MARKING FROM QUESTION 5.2.1**

OPTION 1

C TO D

$W_{net} = \Delta E_k$ (no formula mark)

$-23,59$ ✓ $= \frac{1}{2}m(v_f^2 - v_i^2)$

$= \frac{1}{2}(5,9)(0 - v_i^2)$ ✓

$v_i = 2,8278$

Carry over

A - C

$E_{MA} = E_{MC}$ ✓ (formula mark)

$mgh + \frac{1}{2}mv^2 = mgh + \frac{1}{2}mv^2$

$\underline{(5,9)(9,8)h + \frac{1}{2}(5,9)(0)^2}$ ✓ $= \underline{(5,9)(9,8)(0) + \frac{1}{2}(5,9)(2,8278)^2}$ ✓

$h = 0,41$ m ✓ (Range: 0,40799)

OPTION 2

$W_{net} = \Delta E_k$ (no formula mark)

$-23,59$ ✓ $= \frac{1}{2}m(v_f^2 - v_i^2)$

$= \frac{1}{2}(5,9)(0 - v_i^2)$ ✓

$v_i = 2,8278$

$W_{nc} = \Delta E_k + \Delta E_P = 0$ ✓

$((½)(5,9)(2,8278)^2 - 0)$ ✓ $= -(0 - (5,9)(9,8)h)$ ✓

$h = 0,407$ m ✓

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OPTION 3

$W_{net} = \Delta E_k$ (no formula mark)

-23,59056 ✓ = ½ (5,9)(0^2 - v_i^2)

$$-23{,}59056 = -2{,}95\ v^2$$

$$v_i = 2{,}85214\ m.s^{-1}$$

$$E_{M(A)} = E_{M(C)}$$

$$(E_p + E_k) = (E_p + E_k)$$

$$(mgh + \frac{1}{2}mv^2)_A = (mgh + \frac{1}{2}mv^2)_c$$ ✓

(5,9)(9,8)h + 0✓ = 0 + ½ (5,9)(2,85214)² ✓ (6)

h= 0,415 m ✓

[12]

QUESTION 6/ VRAAG 6

6.1 The (apparent) change in frequency (Pitch) of the wave (or sound) detected by a listener, because the sound and the listener have different velocities relative to the medium of sound propagation.✓✓

OR

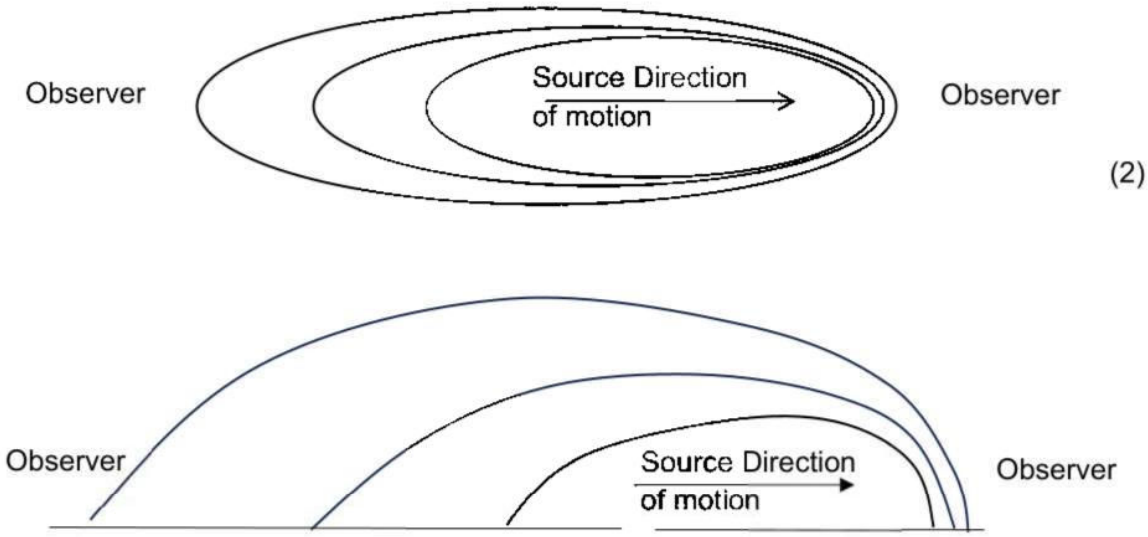
The apparent change in the observed frequency (pitch) of a wave (or sound) when there is relative motion between the source of the wave and an observer (listener).✓✓

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.✓✓

OF

Die skeinbare verandering in die waargenome frekwensie (toonhoogte) wanneer daar relatiewe beweging tussen die bron en luisteraar is.✓✓ (2)

6.2



(2)

Marking Criteria

* Show compressions in front of source✓

* Show depressions behind source✓

NOTE: if direction of motion is not indicated, then 0/2

6.3.1 **OPTION 1**

$f_L = \left(\frac{v \pm v_L}{v \pm v_s}\right) f_S$

TOWARDS

$f_L = \left(\frac{v}{v - v_s}\right) f_S$

$f_S = \left(\frac{v - v_s}{v}\right) f_L$

$= \frac{1800(340 - v_S)}{340}$ ✓ …(1)

AWAY

$f_L = \left(\frac{v}{v + v_s}\right) f_S$

$f_S = \left(\frac{v + v_s}{v}\right) f_L$

$= \frac{1440\ (340 + v_S)}{340}$ ✓ …(2)

✓ **Any formula**

Note that f_s is made the object of equation.

(1)= (2) ✓(equating the two derived formulae)

$\left(\frac{v - v_s}{v}\right) f_L = \left(\frac{v + v_s}{v}\right) f_L$

$1800(340 - v_S) = 1440\ (340 + v_S)$

$v_S = 37{,}78\ m \cdot s^{-1}$ ✓ $(37{,}777\ m \cdot s^{-1})$

OPTION 2

$f_L = (\frac{v \pm v_L}{v \pm v_s})\ f_S$ ✓

TOWARDS

$f_L = (\frac{340}{340 - v_s})\ f_S$

$f_S = (\frac{340 - v_s}{340})\ f_L$

$340f_s = 1800(340 - v_S)$ ✓ ...(1

AWAY

$f_L = (\frac{340}{340 + v_s})\ f_S$

$f_S = (\frac{340 + v_s}{340})\ f_L$

$340f_s = 1440\ (340 + v_S)$ ✓

(1)= (2)✓

$1800(340 - v_S) = 1440\ (340 + v_S)$

$v_S = 37{,}78\ m \cdot s^{-1}$ ✓ $(37{,}777\ m \cdot s^{-1})$ (5)

6.3.2 **POSITIVE MARKING FROM QUESTION 6.3.1**

OPTION 1

$f_s = 1800\ (\frac{340 - 37{,}777}{340})$ ✓

= 1600,00 Hz ✓

OPTION 2

$f_s = 1440\ (\frac{340+37{,}777}{340})$ ✓

= 1600,00 Hz ✓ (Range: 1599,9967 $m.s^{-1}$) (2)

[11]

QUESTION/VRAAG 7

7.1 The electric field at a point is the electrostatic force experienced per unit positive charge placed at that point.✓✓

Die elektriese veld by 'n punt is die elektrostatiese krag wat per eenheid positiewe lading uitgeoefen word. ✓✓ (2)

7.2 From: $E_A = \frac{F_{A\ on\ B}}{q_B}$

$Slope, m = \frac{\Delta E}{\Delta F} = \frac{1}{q_B}$

$$\text{slope} = \frac{0{,}675 - 0\checkmark}{1{,}688 \times 10^{-6} - 0\checkmark}$$

$= 3{,}9988 \times 10^{5}\checkmark$

∴ $q = 2{,}50 \times 10^{-6}$ C (range = $2{,}50074 \times 10^{-6}$ C)✓

OPTION 2

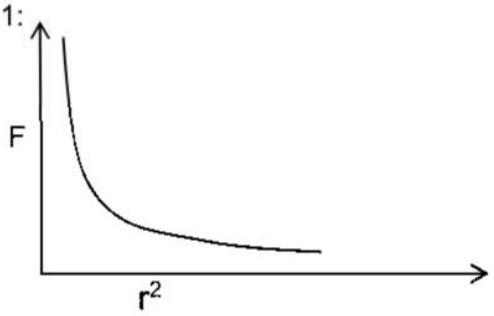
$E = \frac{F}{q}\checkmark$

$q = \frac{1{,}688 \times 10^{-6}\checkmark}{0{,}675\checkmark}$

$q = 2{,}50 \times 10^{-6}$ C✓

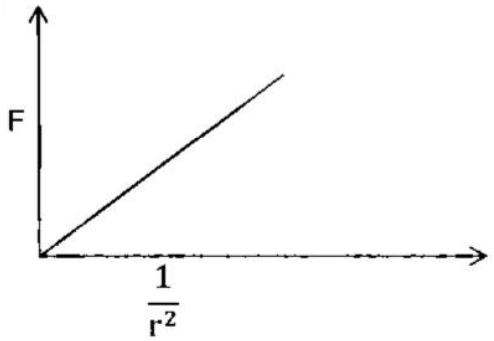
(4)

7.3 Graph 1:



ACCEPT

Graph 2:



Marking criteria:

* Correct axis **and** Correct shape ✓✓

NOTE:

If axis are reversed, 1/2 (since distance is the independent variable and r^2 should be on x-axis)

If graphs are mixed 0/2 (i.e shape of graph 2 on axis of graph 1 or vice versa)

(2)

[08]

QUESTION/VRAAG 8

8.1.1 12 V ✓ (1)

8.1.2 Internal resistance ✓ (1)

8.2.1 Using the following formula:

$$\varepsilon = I(R + r)$$

$$\varepsilon = V_{external} + Ir$$

$$V_{ext} = -rI + \varepsilon$$

$$\text{slope, m} = \frac{\Delta V}{\Delta I} = -r$$

$$= \frac{9,5 - 12}{1,5 - 0} \checkmark$$

r =-(-1,6667)

r = 1,6667 Ω✓ (2)

OPTION 2

$\varepsilon = V_{external} + V_{internal}$

$12 = 9,5 + V_{internal}$

$V_{internal} = 2,5$ V

V = Ir

2,5 = (1,5)r ✓

r = 1,67 Ω ✓

8.2.2 **POSITIVE MARKING FROM QUESTION 8.2.1**

$\varepsilon = I(R + r)$✓

12 ✓= 1,2(R + 1,6667)✓

R = 8,3333 Ω✓ (4)

8.3.1 $R_2 = R_1 = ½ R_3$

$\therefore V_{over\ R2} = \frac{7}{2} = 3,5V$✓

$V_{external} = \underline{7 + 3,5}$✓ = 10,5 V (Addition ✓)

$\varepsilon = V_{int} + V_{ext}$

$\varepsilon = I(R + r)$

$\varepsilon = Ir + V_{ext}$

$\underline{12 = I(1,14) + 10,5}$✓

I = 1,32 A✓ (Range: 1,315789 A)

OPTION 2

$\varepsilon = I(R + r)$

12✓ = I(3x + 1,14)✓

$I = \frac{12}{3x+1,14}$

$I = \frac{V}{R}$

$\frac{12}{3x+1,14} = \frac{7}{2x}$✓

x = 2,66

$R_3 = 5,32\ \Omega$

$V = IR$

$7 = I\ (5,32)$

$I = 1,32\ A$ ✓

(4)

8.3.2 **POSITIVE MARKING FROM QUESTION 8.3.1**

OPTION 1

$R_3 = \frac{V_3}{I}$ ✓

$= \frac{7}{1,315789}$ ✓

R_3 = 5,32 Ω✓ (range: 5,30 – 5,32)

OPTION 2

$\varepsilon = I(R + r)$✓

12 = (1,315789)(R +1,14)

R_T = 7,98

$R_3 = \frac{2}{3}(7,98)$ ✓

R_3= 5,32 Ω ✓

OPTION 3

$R_{ext} = \frac{V_{ext}}{I}$ ✓

$R_{ext} = \frac{10,5}{1,32}$

R_{ext} = 7,9545 Ω

$R_3 = \frac{2}{3}(7,95)$ ✓

R_3= 5,30 Ω ✓

(3)

8.4 INCREASE ✓

* Total resistance will decrease ✓

* Current is inversely proportional to resistance / $I \propto \frac{1}{R}$ ✓

OR

- Total resistance decrease ✓
- From the formula $R = \frac{V}{I}$ as total resistance decrease, current will increase ✓

TOENEEM ✓

- *Totale weerstand neem af* ✓
- *Stroom is omgekeerd eweredig aan weerstand* ✓

8.5 **POSITIVE MARKING FROM QUESTION 8.3.2 (Value of R_3)**

Calculation of R_T

$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2}$

$\frac{1}{R_p} = \frac{1}{2,66} + \frac{1}{2,66}$ ✓ (Substitution to calculate R_P)

R_p = 1,33

R_T = 1,33 + 5,32 ✓ (Adding answer to 5,32)

R_T = 6,64 Ω

$\varepsilon = I(R + r)$

12 = I (6,64 + 1,14)

I = 1,5424 A (Range: 1,54 A)

Current in $R_2 = \frac{1}{2}(1{,}54)$✓

= 0,7712 (Range: 0,77)

$P = I^2R$✓

$= (0{,}7712)^2(2{,}66)$ ✓

= 1,582 W ✓ (Range: 1,577 W)

(6)

[24]

QUESTION/VRAAG 9

9.1 DC/Direct current✓ Motor ✓

GS/Gelykstroom ✓ Motor ✓ (2)

9.2 From electrical✓ to mechanical energy ✓

Van elektriese ✓ energie na meganiese energie ✓ (2)

9.3.1 The alternating current which dissipates/produces the same amount of energy as an equivalent direct current (DC).✓✓

Die wisselstroom wat dieselfde hoeveelheid energie verbruik/oordra as 'n ekwivalente gelykstroom.✓✓ (2)

9.3.2 **OPTION 1**

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

$I_{rms} = \frac{15}{\sqrt{2}}$✓

$= 10{,}6066$ (A)✓

$P_{ave} = I_{rms}^2 R$✓

$P = (10{,}6066)^2(4{,}5)$✓

$P = 506{,}249836$W ✓

OPTION 2

$P = I^2 R$ ✓

$= (15)^2(4{,}5)$✓

= 1012,5 (W)✓

$P_{ave} = \frac{0 + 1012{,}5}{2}$✓

P_{ave} = 506,25 W✓

OPTION 3:

$P_{ave} = I_{rms}^2 R$✓

$= \left(\frac{15}{\sqrt{2}}\text{ ✓✓}\right)^2 (4,5)$✓

= 506,25 W✓

OPTION 4 (answers 9.3.3 first)

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

$= \frac{15}{\sqrt{2}}$✓✓ (4,5)

= 47,73 V

$P_{ave} = I_{rms}V_{rms}$✓

= (10,6066)(47,73) ✓

= 506,25 W ✓

(5)

9.3.3 **POSITIVE MARKING FROM 9.3.2**

OPTION 1:

$P_{ave} = I_{rms}V_{rms}$ ✓

506,249836 = 10,6066 V_{rms}✓

V_{rms} = 47,7297 V ✓

OPTION 2:

$P_{ave} = \frac{V_{rms}^2}{R}$✓

$506,249836 = \frac{V_{rms}^2}{4,5}$✓

V_{rms} = 47,7297 V✓

OPTION 3:

$V_{rms} = I_{rms}R$✓

$V_{rms} = (10,6066)(4,5)$✓

$V_{rms} = 47,7297\ V$✓

OPTION 4

$V_{max} = I_{max}R$✓ $= (15)(4,5)$✓ $= 67,50V$

$V_{rms} = \frac{V_{max}}{\sqrt{2}} = \frac{67,50}{\sqrt{2}} = 47,7297$ V✓

(3)

9.3.4 $f = \frac{1}{T}$ ✓ $= \frac{1}{0,1}$✓ $= 10$ Hz✓ (3)

[17]

QUESTION 10/ VRAAG 10

10.1 The process whereby electrons are ejected from a metal surface when light of suitable frequency is incident on that surface. ✓✓

Die proses waardeur elektrone uit 'n metaaloppervlak vrygestel word wanneer lig van geskikte frekwensie invallend op die oppervlak is. ✓✓ (2)

10.2 Gold ✓✓ (2)

10.3 $6,63 \times 10^{-34}$ (J·s)✓✓ (2)

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

Die minimum energie benodig om 'n elektron uit die oppervlak van 'n metaal vry te stel. ✓✓

(2)

10.5 $W_0 = 6,57 \times 10^{-19}$ J✓✓ (2)

10.6 **POSITIVE MARKING FROM QUESTION 10.5**

$$E_{light} = W_O + E_{K_{max}} \checkmark$$

$$(6,57 \times 10^{-19})\checkmark = (3,85 \times 10^{-19})\checkmark + \frac{1}{2}(9,11 \times 10^{-31})v_{max}^2\checkmark$$

$$v = 7,7275 \times 10^5 \text{ m·s}^{-1} \checkmark$$

(5)

[15]

GRAND TOTAL/GROOTTOTAAL: 150

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