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**NATIONAL
SENIOR CERTIFICATE
NACIONALE
SENIOR SERTIFIKAAT**

GRADE/GRAAD 12

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

SEPTEMBER 2023

MARKING GUIDELINES/NASIENRIGLYNE

MARKS/PUNTE: 150

These marking guideline consists of 14 pages

Hierdie nasienriglyne bestaan uit 14 bladsye

QUESTION 1 / VRAAG 1

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



QUESTION 2 / VRAAG 2**2.1 Marking criteria/Nasienkriteria**

If any one 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.

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 resultant/net force and inversely proportional to the mass of the object. ✓✓

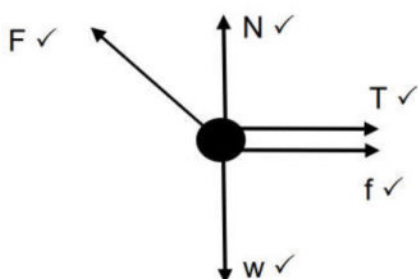
Wanneer 'n resulterende/netto krag op 'n voorwerp inwerk, versnel die voorwerp in die rigting van die krag teen 'n versnelling direk eweredig aan die resultante/netto krag en omgekeerd eweredig aan die massa van die voorwerp.

OR/OF

The resultant/net force acting on an object is equal to the rate of change of momentum of the object. **(2 or 0)**

Die resulterende/netto krag wat op 'n voorwerp inwerk is gelyk aan die tempo van verandering van momentum. **(2 of 0)**

(2)

2.2

(5)

Accepted labels / Aanvaarde benoemings

w	F_g / F_w / force of earth on block / weight / mg / gravitational force / VALUE
F	F_{applied} / F_A / Applied force
T	Tension in rope / F_T
F	F_{friction} / F_f / frictional force /
N	Normal force / F_N

Notes/Aantekeninge:

- Mark awarded for label and arrow.
- Any additional forces: deduct 1 mark: max $\frac{4}{5}$
- No labels: deduct 1 mark: max $\frac{4}{5}$
- If everything correct, but no arrows: deduct 1 mark: $\frac{4}{5}$
- Force(s) not touching object: deduct 1 mark: max $\frac{4}{5}$
- Ignore relative sizes of the vectors

2.3.1 **Marking criteria/Nasienkriteria:**

- Formula for block A or block B ✓
- Substitution of F_{net} for block A ✓
- Substitution of F_{net} for block B ✓
- 8a **OR** 4a ✓
- Answer ✓

For Block A:	} Any one ✓	For Block B:
$F_{\text{net}} = ma$		$F_{\text{net}} = ma$
$F_x + (-T) + (-f) = ma$		$F_g + T + (-F) = ma$
$(75)\cos 25^\circ - T - 11,76 \checkmark = 4a \checkmark$		$78,4 + T - 96 \checkmark = 8a$
$56,21 - T = 4a$		$T - 17,6 = 8a$
$T = -4a + 56,21$		$T = 8a + 17,6$
$\therefore -4a + 56,21 = 8a + 17,6$ $12a = 38,61$ $a = 3,22 \text{ m}\cdot\text{s}^{-2} \checkmark$		

(5)

2.3.2 **POSITIVE MARKING FROM QUESTION 2.3.1****Marking criteria/Nasienkriteria:**

- Substitution to calculate T ✓
- Answer ✓

For Block A:	For Block B:
$T = -4a + 56,21$	$T = 8a + 17,6$
$= (-4)(3,22) + 56,21 \checkmark$	$= (8)(3,22) + 17,6$
$= 43,33 \text{ N} \checkmark$	$= 43,36 \text{ N}$

(2)

[14]**QUESTION 3 / VRAAG 3**

- 3.1 An object which has been given an initial velocity and then it moves under the influence of the gravitational force only. ✓ ✓ **(2 or 0)**

'n Voorwerp waaraan 'n beginsnelheid gegee is en wat dan slegs onder die invloed van die gravitasiekrag beweeg. **(2 or 0)**

(2)

3.2.1

Upwards positive/ Opwaarts positief: $\Delta y = v_i \Delta t + \frac{1}{2} a \Delta t^2 \checkmark$ $-48 \checkmark = v_i(2,8) + \frac{1}{2}(-9,8)(2,8)^2 \checkmark$ $v_i = -3,42$ $v_i = 3,42 \text{ m}\cdot\text{s}^{-1} \checkmark$	Downwards positive/ Afwaarts positief: $\Delta y = v_i \Delta t + \frac{1}{2} a \Delta t^2 \checkmark$ $48 \checkmark = v_i(2,8) + \frac{1}{2}(9,8)(2,8)^2 \checkmark$ $v_i = 3,42 \text{ m}\cdot\text{s}^{-1} \checkmark$
---	--

(4)

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

OPTION 1

**Upwards Positive/
Opwaarts positief**

$$v_f = v_i + a \Delta t \checkmark$$

$$v_f = \underline{-3,42 + (-9,8)(2,8)} \checkmark$$

$$v_f = -30,86 \text{ m} \cdot \text{s}^{-1} \checkmark$$

$$v_f = 30,86 \text{ m} \cdot \text{s}^{-1} \checkmark$$

**Downwards Positive/
Afwaarts positief**

$$v_f = v_i + a \Delta t \checkmark$$

$$v_f = \underline{3,42 + (9,8)(2,8)} \checkmark$$

$$v_f = 30,86 \text{ m} \cdot \text{s}^{-1} \checkmark$$

OPTION 2

**Upwards Positive/
Opwaarts positief**

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

$$v_f^2 = \underline{(-3,42)^2 + 2(-9,8)(-48)} \checkmark$$

$$v_f = 30,86 \text{ m} \cdot \text{s}^{-1} \checkmark$$

**Downwards Positive/
Afwaarts positief**

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

$$v_f^2 = \underline{(3,42)^2 + 2(9,8)(48)} \checkmark$$

$$v_f = 30,86 \text{ m} \cdot \text{s}^{-1} \checkmark$$

OPTION 3

**Upwards Positive/
Opwaarts positief**

$$\Delta x = \frac{(v_f + v_i)}{2} \Delta t \checkmark$$

$$-48 = \frac{(v_f - 3,42)}{2} 2,8 \checkmark$$

$$v_f = -30,87 \text{ m} \cdot \text{s}^{-1} \checkmark$$

$$v_f = 30,87 \text{ m} \cdot \text{s}^{-1} \checkmark$$

**Downwards Positive/
Afwaarts positief**

$$\frac{(v_f + v_i)}{2} \Delta t \checkmark$$

$$48 = \frac{(v_f + 3,42)}{2} 2,8 \checkmark$$

$$v_f = 30,87 \text{ m} \cdot \text{s}^{-1} \checkmark$$

OPTION 4

$$(E_m)_A = (E_m)_B \quad \left. \begin{array}{l} \text{Any one } \checkmark \\ \text{Enige een} \end{array} \right\}$$

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

$$\underline{m(9,8)(48) + \frac{1}{2}m(3,42)^2 = 0 + \frac{1}{2}mv^2} \checkmark$$

$$v = 30,86 \text{ m} \cdot \text{s}^{-1} \checkmark$$

OPTION 5

$$F_{\text{net}} \Delta t = \Delta p$$

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

$$mg \Delta t = mv_f - mv_i$$

$$g \Delta t = v_f - v_i$$

$$\underline{(9,8)(2,9) = v_f - 3,42} \checkmark$$

$$v = 30,86 \text{ m} \cdot \text{s}^{-1} \checkmark$$

Any one $\checkmark$
Enige een

(3)

3.2.3 **Upwards positive /
Opwaarts positief**

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

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

$$v_i = 12,52 \text{ m} \cdot \text{s}^{-1} \checkmark$$

**Downwards positive/
Afwaarts positief**

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

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

$$v_i = 12,52 \text{ m} \cdot \text{s}^{-1} \checkmark$$

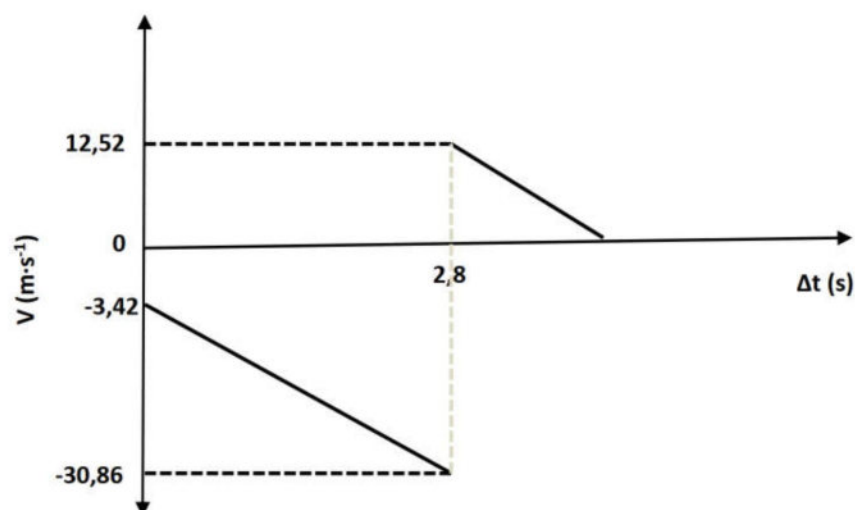
(3)

3.3

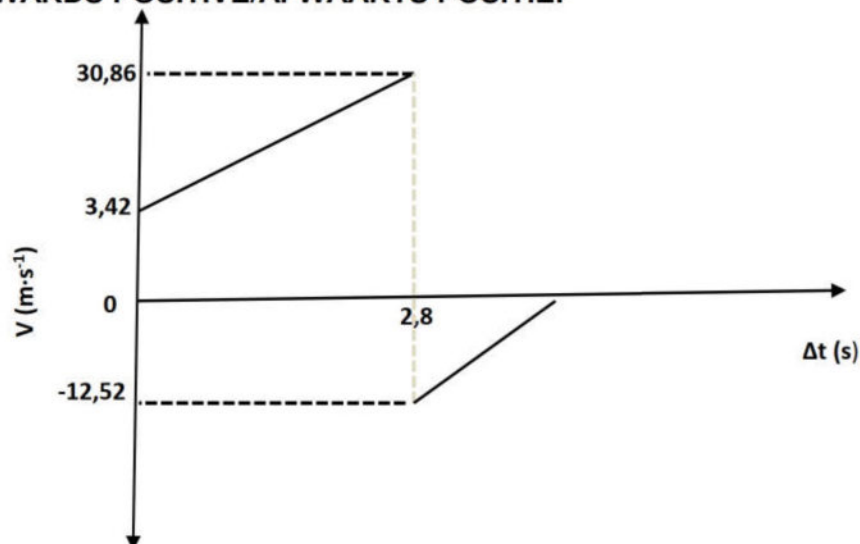
Marking criteria/Nasienkriteria:

- Initial velocity with which the ball was thrown (3.2.1) ✓
- Beginsnelheid waarmee bal gegooi is
- Final velocity with which the ball hit the ground (3.2.2) ✓
- Eindsnelheid waarmee die bal die grond tref
- Time taken to hit the ground (2,8 s) ✓
- Tyd om die grond te tref (2,8 s)
- The velocity with which the ball bounces off the ground – line parallel to other line (3.2.3) ✓
- Die snelheid waarmee die bal van die grond as bons – lyn parallel met ander lyn

**POSITIVE MARKING FROM/POSITIEWE MERK VANAF 3.2.1., 3.2.2 & 3.2.3
UPWARDS POSITIVE/OPWAARTS POSITIEF**



DOWNWARDS POSITIVE/AFWAARTS POSITIEF



(4)
[16]

QUESTION 4 / VRAAG 4

4.1

Marking criteria/Nasienkriteria

If any one 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 total (linear) momentum of an isolated/closed system remains constant/is conserved. ✓✓

Die totale (lineêre) momentum in 'n geïsoleerde sisteem bly konstant/behoue.

(2)

4.2.1

TAKE TO THE LEFT AS POSITIVE/NEEM LINKS AS POSITIEF

$$\left. \begin{aligned} \Sigma p_i &= \Sigma p_f \\ (mv_i)_1 + (mv_i)_2 &= (mv_f)_1 + (mv_f)_2 \end{aligned} \right\} \checkmark \text{ Any one/enige een}$$

$$(0,015)(-45) + (8,45)(0) \checkmark = (0,015)(10,60) + (8,45)(v_f) \checkmark$$

$$v = -0,10 \text{ m} \cdot \text{s}^{-1}$$

$$v = 0,10 \text{ m} \cdot \text{s}^{-1} \checkmark$$

TAKE TO THE RIGHT AS POSITIVE/NEEM REGS AS POSITIEF

$$\left. \begin{aligned} \Sigma p_i &= \Sigma p_f \\ (mv_i)_1 + (mv_i)_2 &= (mv_f)_1 + (mv_f)_2 \end{aligned} \right\} \checkmark \text{ Any one/enige een}$$

$$(0,015)(45) + (8,45)(0) \checkmark = (0,015)(-10,60) + (8,45)(v_f) \checkmark$$

$$v = 0,10 \text{ m} \cdot \text{s}^{-1} \checkmark$$

(4)

4.2.2

POSITIVE MARKING FROM QUESTION 4.2.1**OPTION 1**

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

$$0^2 \checkmark = (0,10)^2 + 2(a)(1,32) \checkmark$$

$$a = -0,00378 \text{ m} \cdot \text{s}^{-2} \quad (a = -3,79 \times 10^{-3} \text{ m} \cdot \text{s}^{-2})$$

$$F_{\text{net}} = ma \checkmark$$

$$f = (8,45)(-0,00378) \checkmark$$

$$f = 0,03 \text{ N} \checkmark$$

POSITIVE MARKING FROM QUESTION 4.2.1**OPTION 2**

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

$$0^2 = (0,10)^2 + 2(a)(1,32) \checkmark$$

$$a = -0,00378 \text{ m} \cdot \text{s}^{-2} \quad (a = -3,79 \times 10^{-3} \text{ m} \cdot \text{s}^{-2})$$

$$v_f = v_i + a \Delta t$$

$$0 = 0,10 + (-0,00378) \Delta t$$

$$\Delta t = 26,39 \text{ s} \checkmark$$

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

$$f(26,39) = (8,45)(0) - (8,45)(0,10) \checkmark$$

$$f = -0,03 \text{ N}$$

$$f = 0,03 \text{ N} \checkmark$$

(5)

[11]

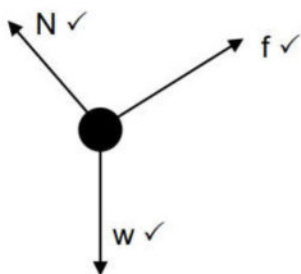
QUESTION 5 / VRAAG 5**5.1 Marking criteria/Nasienkriteria**

If any one 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 force for which the work done in moving an object between two points depends on the path taken ✓✓

'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

(3)

Accepted labels / Aanvaarde benoemings

w	F_g / F_w / force of earth on block / weight / mg / gravitational force /
f	F_{friction} / F_f / frictional force
N	Normal force / F_N

5.3 $f_k = \mu_k N$ ✓ $N = F_{g\perp}$
 $= (0,45)(449,81)$ ✓ $= (53)(9,8)\cos 30^\circ$
 $= 202,42 \text{ N}$ ✓ $= 449,81 \text{ N}$

(3)

5.4 Marking criteria/Nasienkriteria

If any one 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 net work done on an object is equal to the change in kinetic energy of the object. ✓✓

Die netto arbeid verrig op 'n voorwerp is gelyk aan die verandering in kinetiese energie van die voorwerp **OF** die arbeid verrig op die voorwerp deur 'n netto krag is gelyk aan die verandering in kinetiese energie van die voorwerp.

(2)

5.5 POSITIVE MARKING FROM Q5.3**OPTION 1**

$$W_{\text{net}} = \Delta E_k$$

$$f\Delta x \cos \theta + N\Delta x \cos \theta + F_g\Delta x \cos \theta = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2$$

$$(202,42)(35)\cos 180^\circ + 0 + (53)(9,8)(35)\cos 60^\circ = \frac{1}{2}(53)v_f^2 - 0$$

$$v_f = 8,70 \text{ m}\cdot\text{s}^{-1} \text{ ✓}$$

} Any one ✓



OPTION 2

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

$$f\Delta x \cos\theta = [\frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2] + [mgh_f - mgh_i]$$

} Any one ✓

$$(202,42)(35)\cos 180^\circ = [\frac{1}{2}(53)v_f^2 - 0] + [(53)(9,8)(17,5) - (53)(9,8)(35)]$$

$$v_f = 8,70 \text{ m}\cdot\text{s}^{-1} \checkmark$$

(5)

[15]**QUESTION 6 / VRAAG 6**

6.1 Doppler effect / effek ✓

(1)

6.2

$$v = f\lambda$$

$$340 = 780\lambda \checkmark$$

$$\lambda = 0,44 \text{ m} \checkmark$$

(2)

6.3 Waves in front of source are more compact/ wavelength decreases ✓
 More waves per second reaches the listener ✓

Golwe voor die bron is meer kompak/ golflengte neem af
 Meer golwe per sekonde bereik die luisteraar

(2)

6.4.1

$$f_L = \frac{v \pm v_L}{v \pm v_S} f_S \checkmark \quad \text{OR} \quad f_L = \frac{v}{v - v_S} f_S$$

$$850 \checkmark = \left(\frac{340 + v_L}{340 + 0} \right) 780 \checkmark$$

$$v_L = 30,51 \text{ m}\cdot\text{s}^{-1} \checkmark$$

(5)

6.4.2

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

$$(30,51)^2 = 0^2 + 2a(83,11) \checkmark$$

$$a = 5,60 \text{ m}\cdot\text{s}^{-2} \checkmark$$

(3)

[13]

QUESTION 7 / VRAAG 7

7.1

Marking criteria/Nasienkriteria

If any one 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.

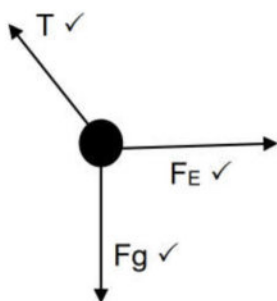
Note: If masses used (0/2)

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 elektrostatische krag wat een puntlading (Q_1) op 'n ander puntlading (Q_2) uitoefen, is direk eweredig aan die produk van die groottes van die ladings ✓ en omgekeerd eweredig aan die kwadraat van die afstand (r) tussen hulle. ✓

(2)

7.2

**Accepted labels / Aanvaarde benoemings**

W	F_g / F_w / force of earth on block / weight / mg / gravitational force / 0,392 N
F_E	Electrostatic force
T	Tension in rope / F_T

(3)

Notes/Aantekeninge:

- Any additional forces: deduct 1 mark: max $\frac{2}{3}$
- No labels: deduct 1 mark: max $\frac{2}{3}$
- No arrows: $\frac{0}{3}$
- Force(s) not touching object: deduct 1 mark: max $\frac{2}{3}$
- Ignore relative sizes of the vectors

7.3.1 $F = \frac{kQ_1Q_2}{r^2} \checkmark$
 $= \frac{(9 \times 10^9)(30 \times 10^{-6})(20 \times 10^{-6})}{(0,8)^2} \checkmark$
 $F = 8,44 \text{ N} \checkmark \quad (8,4375 \text{ N})$

(3)

7.3.2 $F_g = mg$
 $= (0,09)(9,8)$
 $= 0,882 \text{ N} \checkmark$
 $T^2 = F_e^2 + F_g^2 \checkmark$
 $= (8,44)^2 + (0,88)^2 \checkmark$
 $T = 8,49 \text{ N} \checkmark$

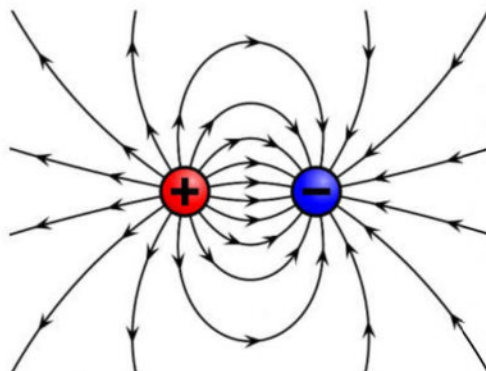
(4)

[12]

QUESTION 8 / VRAAG 8

- 8.1 **Marking criteria/Nasienriglyne:**
 -1 mark for each of the 3 key words omitted in the correct context.
 -1 punt vir elk van die 3 sleutelwoorde weggelaat in die korrekte konteks.
 The electric field is an area in space where an electric charge experiences a force. $\checkmark \checkmark$
 Die elektriese veld is 'n gebied in die ruimte waarin 'n elektriese lading 'n krag ondervind
- (2)

8.2



Criteria for sketch/Kriteria vir skets	Marks/Punte
Correct shape as shown. Korrekte vorm soos getoon.	$\checkmark$
Direction away from positive to negative. Rigting weg van positief na negatief.	$\checkmark$
Field lines start on spheres and do not cross for correct diagram. Veldlyne begin op elke sfeer en kruis nie vir korrekte diagram.	$\checkmark$

(3)



8.3

$$E_{\text{nett}} = E_1 + E_2$$

$$E_{\text{net}} = \frac{kQ}{r^2} - \frac{kQ}{r^2} \checkmark \quad (\text{Mark for/Punt vir } \frac{kQ}{r^2})$$

$$\checkmark 4\,128 = \frac{(9 \times 10^9)(5 \times 10^{-9})}{r^2} \checkmark - \checkmark \frac{(9 \times 10^9)(4 \times 10^{-9})}{(4r)^2} \checkmark$$

$$4\,128 = \frac{45}{r^2} - \frac{36}{16r^2}$$

$$r = 0,10\, \text{m} \checkmark$$

(6)

[11]

QUESTION 9 / VRAAG 99.1 24 Joule ✓ per unit coulomb charge work done. ✓Arbeid van 24 Joule per eenheid coulomb lading

(2)

9.2.1

$$r_i = \frac{\text{lost V}}{I} \checkmark$$

$$I = \frac{24 - 22,3}{0,5} \checkmark$$

$$= 3,4\, \text{A} \checkmark$$

(3)

9.2.2

POSITIVE MARKING FROM Q9.2.1

$$V_{3\Omega} = IR$$

$$= 3,4(3) \checkmark$$

$$= 10,2\, \text{V}$$

$$V_{\parallel} = 22,3 - 10,2 \checkmark$$

$$= 12,1\, \text{V}$$

$$P_{18\Omega} = \frac{V^2}{R} \checkmark$$

$$P_{18\Omega} = \frac{(12,1)^2}{18} \checkmark$$

$$= 8,314\, \text{W} \checkmark$$

(5)

9.2.3

POSITIVE MARKING FROM Q9.2.1 & Q9.2.2

$$I_{6\Omega} = \frac{V}{R} \checkmark$$

$$= \frac{12,1}{6} \checkmark$$

$$= 2,02\, \text{A}$$

$$I_{18\Omega} = \frac{V}{R}$$

$$= \frac{12,1}{18} \checkmark$$

$$= 0,67\, \text{A}$$

$$I_R = I_{\text{tot}} - I_{6\Omega} - I_{18\Omega}$$

$$= 3,4 - 2,02 - 0,67$$

$$= 0,71\, \text{A} \checkmark$$

(4)

- 9.3 Increase ✓
R (18Ω) remains constant, V_{II} increases ✓
Current in circuit decreases
 $P = \frac{V^2}{R}$ ✓

(3)
[17]

QUESTION 10/VRAAG 10

- 10.1 Kinetic/mechanical energy TO electrical energy ✓✓
Kinetiese/meganiese energie NA elektriese energie

(2)

- 10.2 Slip rings (AC) and split rings (DC) ✓
Sleepringe (WS) en splitringe (GS)

(1)

- | | | |
|------|---|--|
| 10.3 | <p>OPTION 1</p> <p>$P_{ave} = I_{rms}^2 R$ ✓
 $100 = I_{rms}^2 (3)$ ✓
 $I_{rms} = 5,77A$</p> <p>$I_{rms} = \frac{I_{max}}{\sqrt{2}}$ ✓
 $5,77 = \frac{I_{max}}{\sqrt{2}}$ ✓
 $I_{max} = 8,16A$ ✓</p> | <p>OPTION 2</p> <p>$P_{ave} = I_{rms}^2 R$ ✓
 $100 = \frac{I_{max}^2}{2} (3)$ ✓
 $I_{max} = 8,16A$ ✓</p> |
|------|---|--|

(5)
[8]

QUESTION 11 / VRAAG 11

- 11.1 **Marking criteria/Nasienkriteria**
 If any one 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 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)

- 11.2 Light source A – higher frequency than f_0 ✓
OR Light source B – lower frequency than f_0

Ligbron A – hoër frekwensie as f_0
OF Ligbron B – laer frekwensie as f_0

Wavelength $\propto \frac{1}{f}$ ✓

Golflengte $\propto \frac{1}{f}$

(2)

11.3.1

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

$$= \frac{(6,63 \times 10^{-34})(3 \times 10^8)}{570 \times 10^{-9}} \checkmark$$

$$= 3,489 \times 10^{-19} \text{ J } \checkmark$$

(3)

11.3.2 **POSITIVE MARKING FROM 11.3.1**

$$E = W_0 + E_{k(\max)} \checkmark$$

$$\frac{hc}{\lambda} = W_0 + \frac{1}{2}mv^2$$

$$\frac{(6,63 \times 10^{-34})(3 \times 10^8)}{480 \times 10^{-9}} \checkmark = (3,489 \times 10^{-19}) \checkmark + \frac{1}{2}(9,11 \times 10^{-31})v^2 \checkmark$$

$$v = 3,79 \times 10^5 \text{ m} \cdot \text{s}^{-1} \checkmark$$

(5)

11.4 Green/Groen $\checkmark$ (1)
[13]

TOTAL/TOTAAL: 150

education

DEPARTMENT: EDUCATION
MPUMALANGA PROVINCE

ERRATA PHYISCAL SCIENCES 2023 GRADE 12 TRIAL PAPER 1

Question	Correction
1.5	Answer is A
5.5	Q5.5 should not be marked; statement was in complete.

BASED ON Q5.5 ABOVE THE TOTAL OF THE PAPER IS NOW 145 MARKS