



education

MPUMALANGA PROVINCE
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE
NASIONALE
SENIOR SERTIFIKAAT**

GRADE/GRAAD 12

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

JUNE/JUNIE 2026

MARKING GUIDELINES/NASIENRIGLYNE

MARKS/PUNTE: 150

**These marking guidelines consists of 15 pages
*Hierdie nasienriglyne bestaan uit 15 bladsye***

QUESTION 1 / VRAAG 1

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

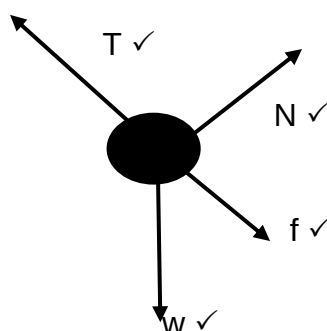
OR/OF

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



(4)

Accepted labels / Aanvaarde benoemings

w	F_g / F_w / force of earth on trolley / weight / mg / gravitational force / 39,2N
T	Tension / F_T / Spanning
f	F_{friction} / F_f / frictional force / wrywing
N	Normal force / F_N

Notes/Aantekeninge:

- Mark awarded for label and arrow./Punt toegeken vir benoeming en pyltjie.
- Any additional forces/Enige ander addisionele krag(te): deduct 1 mark/Trek 1 punt af: max/maks $\frac{3}{4}$
- No labels/Geen byskrifte: deduct 1 mark/trek een punt af: max/maks $\frac{3}{4}$
- If everything correct, but no arrows/Indien alles reg is, maar geen pyltjies: deduct 1 mark/trek 1 punt af: $\frac{3}{4}$
- Force(s) not touching object/Krag(te) wat nie die voorwerp raak nie: deduct 1 mark/trek 1 punt af: max/maks $\frac{3}{4}$
- Ignore relative sizes of the vectors/Ignoreer relatiewe groottes van vektore.

2.3.1

$$f_k = \mu_k N \checkmark$$

$$= (0.2)(4)(9.8)\cos 30^\circ \checkmark$$

$$= 6.79 \text{ N} \checkmark$$

(3)

2.3.2

POSITIVE MARKING FROM QUESTION 2.3.1
POSITIEWE MERK VANAF VRAAG 2.3.1

For trolley Y:

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

$$T + (-f) + ((-F_{\text{gII}}) = ma$$

$$T - 6.79 \checkmark - (4)(9.8)\sin 30^\circ \checkmark = (4)(0.43) \checkmark$$

$$T - 26.39 = 1.72$$

$$T = 28.11 \text{ N} \checkmark$$

Any one/Enige een $\checkmark$

(5)

2.3.3

POSITIVE MARKING FROM QUESTION 2.3.1 & 2.3.2
POSITIEWE MERK VANAF VRAAG 2.3.1 & 2.3.2

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

$$v_f^2 = (0)^2 + 2(0.43)(2) \checkmark$$

$$v_f = 1.31 \text{ m}\cdot\text{s}^{-1} \checkmark$$

(3)

2.4

INCREASES $\checkmark$ Only gravitational acceleration of $9.8 \text{ m}\cdot\text{s}^{-2}$ is working on the ball $\checkmark$ OR $0.43 \text{ m}\cdot\text{s}^{-2}$ increases to $9.8 \text{ m}\cdot\text{s}^{-2}$

OR ball is now in free fall

TOENEEM $\checkmark$ Slegs gravitasieversnelling van $9.8 \text{ m}\cdot\text{s}^{-2}$ werk op die bal $\checkmark$ OF $0.43 \text{ m}\cdot\text{s}^{-2}$ vermeerder tot $9.8 \text{ m}\cdot\text{s}^{-2}$

OF bal is in vryval

(2)

[19]

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)**

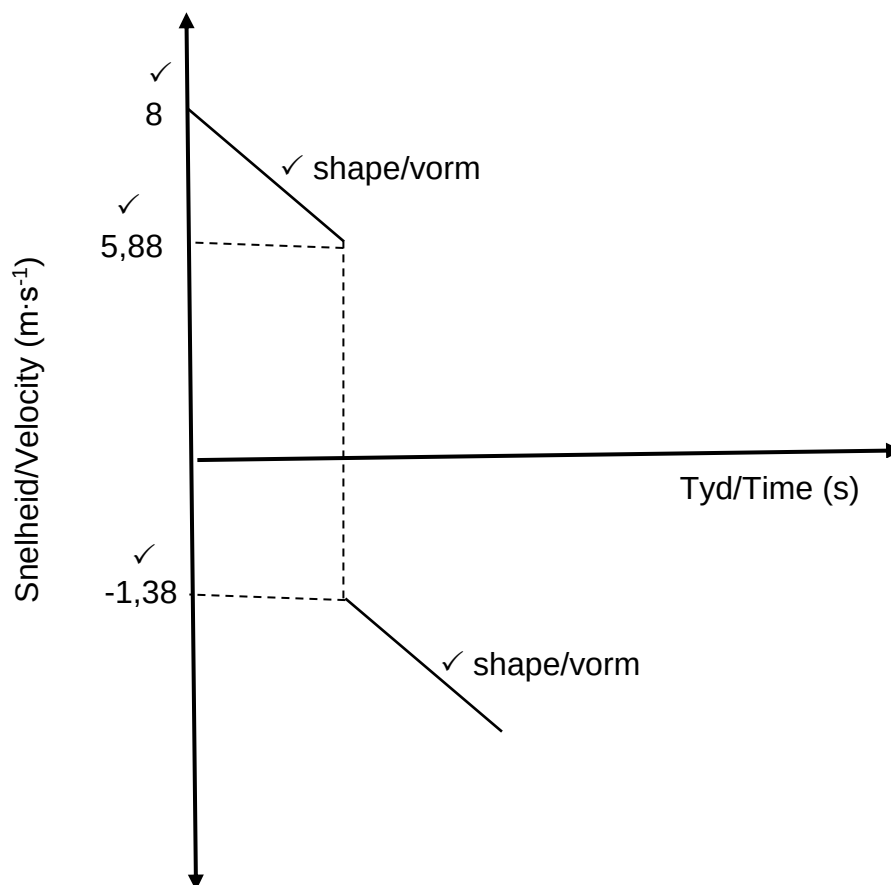
'n Voorwerp waaraan 'n beginsnelheid gegee is en wat dan slegs onder die invloed van die gravitasiekrag beweeg. **(2 or 0)**

(2)

3.2.1	OPTION 1/OPSIE 1 Upwards positive/Opwaarts positief $v_f^2 = v_i^2 + 2a\Delta y$ ✓ $v_f^2 = (8)^2 + 2(-9,8)(1,5)$ ✓ $v_f = 5,88 \text{ m}\cdot\text{s}^{-1}$ ✓	ACCEPT/AANVAAR Downwards positive/Afwaarts positief $v_f^2 = v_i^2 + 2a\Delta y$ $v_f^2 = (-8)^2 + 2(9,8)(-1,5)$ $v_f = 5,88 \text{ m}\cdot\text{s}^{-1}$	(3)
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3.2.2	POSITIVE MARKING FROM QUESTION 3.2.1 POSITIEWE MERK VANAF VRAAG 3.2.1 Upwards positive/Opwaarts positief Time it took to reach the ceiling: Tyd wat dit neem om die plafon te bereik: $v_f = v_i + a\Delta t$ ✓ $5,88 = 8 + (-9,8)\Delta t$ ✓ $\Delta t = 0,22 \text{ s}$ Time it took for ball to bounce back: Tyd vir bal om terug te hop; $0,65 - 0,22 = 0,43 \text{ s}$ ✓ Initial velocity of the ball when it bounces back: Aanvanklike snelheid van bal wanneer dit terug hop: $\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$ ✓ $-1,5 = v_i(0,43) + \frac{1}{2}(-9,8)(0,43)^2$ ✓ $v_i = -1,38 \text{ m}\cdot\text{s}^{-1}$ $v_i = 1,38 \text{ m}\cdot\text{s}^{-1}$ ✓	(6)
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3.3

(5)
[16]

QUESTION 4 / VRAAG 4

- 4.1 The total linear momentum of an isolated system remains constant (is conserved). ✓✓ **(2 or 0)**
 Die totale lineêre momentum in 'n geïsoleerde sisteem bly konstant (behoue). **(2 of 0)** (2)

- 4.2 Equal to / Gelyk aan ✓ (1)

- 4.3 The change in momentum for both objects are equal and opposite ✓
 The impulse experienced by both objects is equal and opposite ✓
 For the same time interval $F_1 = -F_2$ ✓

Die verandering in momentum vir beide voorwerpe is gelyk en teenoorgesteld
 The impulse experienced by both objects is equal and opposite } Die impuls wat deur beide voorwerpe ondervind word is gelyk en teenoorgesteld
 Vir dieselfde tyd interval is $F_1 = -F_2$

ACCEPT when a learner states Newton's third law
 When object A exerts a force on object B, ✓ object B SIMULTANEOUSLY exerts ✓ an oppositely directed force of equal magnitude on object A. ✓

AANVAAR wanneer 'n leerder Newton se derde wet stel
 Wanneer voorwerp A 'n krag op voorwerp B uitoefen, sal voorwerp B GELYKTYDIG 'n krag van gelyke grootte en in die teenoorgestelde rigting op voorwerp A uitoefen. (3)

- 4.4.1 **TAKE TO THE RIGHT AS POSITIVE/NEEM NA REGS AS POSITIEF**

$$\left. \begin{aligned} \Sigma p_i &= \Sigma p_f \\ (m_1 + m_2)v_i &= (mv_f)_1 + (mv_f)_2 \end{aligned} \right\} \text{✓ Any one/enige een}$$

$$(1 + 100)(0) \text{✓} = (1)(10) + (100)v_{f2} \text{✓}$$

$$v_{f2} = -0,1 \text{ m} \cdot \text{s}^{-1}$$
 velocity/snelheid = $0,1 \text{ m} \cdot \text{s}^{-1}$ ✓
 $\Delta x = v\Delta t$
 $60 = (0,1)\Delta t \text{✓}$
 $\Delta t = 600 \text{ s} \text{✓}$ (6)

- 4.4.2 $F\Delta t = \Delta p$
 $F\Delta t = m\Delta v$
 Impulse / Impuls = $1(10-0) \text{✓}$
 Impulse / Impuls = $10 \text{ N} \cdot \text{s} \text{ (kg} \cdot \text{m} \cdot \text{s}^{-1}) \text{✓}$ (2)

[14]

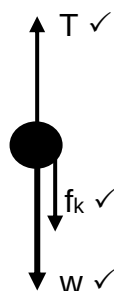
QUESTION 5 / VRAAG 5

- 5.1 A non-conservative force is a force for which the work done in moving an object between two points depends on the path taken. ✓✓ **(2 or 0)**

'n Nie-konserwatiewe krag as '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 Tension in the cable / air friction ✓
Spankrag in die kabel / lugweerstand (1)

5.3



(3)

Accepted labels / Aanvaarde benoemings	
w	F_g / F_w / force of earth on block / weight / mg / gravitational force /1470 N
f	F_{friction} / F_f / frictional force /wrywing
T	Tension / F_T / Spanning

Notes/Aantekeninge:

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- Any additional forces/Enige addisionele kragte: deduct 1 mark/trek 1 punt af: max/maks $\frac{2}{3}$
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- Force(s) not touching object/Krag(te) raak nie die voorwerp nie: deduct 1 mark/trek 1 punt af: max/maks $\frac{2}{3}$
- Ignore relative sizes of the vectors/Ignoreer relatiewe groottes van vektore.

- 5.4 $W = F_T \Delta x \cos \Theta$ ✓
 $= (10\,000)(12) \cos 0^\circ$ ✓
 $= 120\,000 \text{ J}$ ✓ (3)

- 5.5 The net work done on an object is equal to the change in the object's kinetic energy OR the work done on an object by a net force is equal to the change in the object's kinetic energy. ✓✓ **(2 or 0)**

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)

- 5.6 **POSITIVE MARKING FROM QUESTION 5.2**
POSITIEWE MERK VANAF VRAAG 5.2

OPTION 1/OPSIE 1

$$\begin{aligned}
 W_{\text{net}} &= \Delta E_k \\
 W_G + W_F + W_f &= \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2 \\
 fg_{\parallel}\Delta x \cos\Theta + F\Delta x \cos\Theta + W_f &= \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2 \\
 \underline{(150)(9,8)(12)\cos 180^\circ + 12\,000} &+ W_f = \left[\frac{1}{2}(150)(5)^2 - \left[\frac{1}{2}(150)(0)^2 \right] \right] \checkmark \\
 W_f &= 17\,640 - 120\,000 + 1\,875 \\
 W_f &= -100\,485 \text{ J } \checkmark
 \end{aligned}
 \quad \left. \vphantom{\begin{aligned} W_{\text{net}} &= \Delta E_k \\ W_G + W_F + W_f &= \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2 \\ fg_{\parallel}\Delta x \cos\Theta + F\Delta x \cos\Theta + W_f &= \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2 \end{aligned}} \right\} \text{Any one/enige een } \checkmark$$

OPTION 2/OPSIE 2

$$\begin{aligned}
 W_{\text{nc}} &= \Delta E_p + \Delta E_k \\
 W_F + W_f &= [mgh_f - mgh_i] + \left[\frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2 \right] \\
 \underline{120\,000} &+ W_f = \left[(150)(8)(12) - 0 \right] + \left[\frac{1}{2}(150)(5)^2 - \left[\frac{1}{2}(150)(0)^2 \right] \right] \checkmark \\
 W_f &= -100\,485 \text{ J } \checkmark
 \end{aligned}
 \quad \left. \vphantom{\begin{aligned} W_{\text{nc}} &= \Delta E_p + \Delta E_k \\ W_F + W_f &= [mgh_f - mgh_i] + \left[\frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2 \right] \end{aligned}} \right\} \text{Any one/enige een } \checkmark$$

(4)
[15]

QUESTION 6 / VRAAG 6

6.1.

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 change in frequency/pitch/wavelength 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 van frekwensie/toonhoogte/golflengte van die klank waargeneem deur 'n luisteraar omdat die klankbron en die luisteraar verskillende snelhede relatief tot die medium van klankvoorplanting het.

OR/OF

An (apparent) change in observed frequency/pitch/wavelength as the result of the relative motion between a source and an observer/listener. ✓✓

'n (Skynbare) verandering in waargenome frekwensie/toonhoogte/golflengte as gevolg van die relatiewe beweging tussen die bron en 'n waarnemer/luisteraar.

(2)

6.2.1 $v = f \cdot \lambda$ ✓

$$335 = f(0,82) \quad \checkmark$$

$$f = 408,54 \text{ Hz} \quad \checkmark$$

(3)

6.2.2

POSITIVE MARKING FROM QUESTION 6.2.1**POSITIEWE MERK VANAF VRAAG 6.2.1**

Away

Towards

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

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

$$305 \checkmark = \left(\frac{335}{335 + v_S} \right) f_S \checkmark \quad \text{equation 1} \quad 408,54 \checkmark = \left(\frac{335}{335 - v_S} \right) f_S \checkmark \quad \text{equation 2}$$

equation 1 = equation 2

$$305(335 + v_S) = 408,54(335 - v_S) \quad \checkmark$$

$$V_S = 48,61 \text{ m} \cdot \text{s}^{-1} \quad \checkmark$$

(7)

6.3

Detect the heartbeat of a foetus, detect the rate of blood flow, detect blockages in arteries, heart valve function ✓✓

Any other relevant/correct answer.

Waarneming van die hartklop van 'n fetus, waarneming van tempo van bloedvloei, Waarneming van blokkasie in arteries, hartklep se funksie ✓✓

Enige ander relevante/ korrekte antwoord

(2)

[14]

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)

Nota: As massas gebruik is (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 elektrostatiese 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

(Electrostatic) force is directly proportional to electrostatic fieldstrength ✓✓
(Elektrostatiese) krag is direk eweredig aan elektrostatiese veldsterkte

(2)

7.3

Unit charge ✓✓
Eenheidslading

(2)

7.4.1

$$\text{Gradient} = \frac{\Delta y}{\Delta x} \checkmark$$

$$= \frac{5 \times 10^{-8}}{1 \times 10^3} \checkmark \quad (\text{or any other reading / enige ander lesing})$$

$$= 5 \times 10^{-11} \text{ (C)} \checkmark$$

(3)

7.4.2

POSITIVE MARKING FROM QUESTION 7.4.1
POSITIEWE MERK VANAF VRAAG 7.4.1

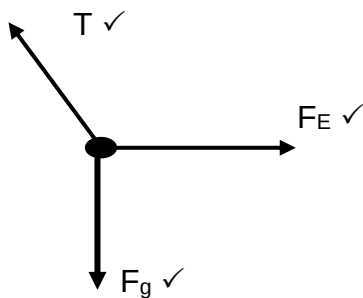
$$n = \frac{Q}{e} \checkmark$$

$$n = \frac{5 \times 10^{-11}}{1,6 \times 10^{-19}} \checkmark$$

$$n = 3,13 \times 10^8 \text{ (electrons / elektrone)} \checkmark$$

(3)

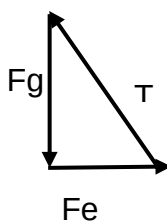
[12]

QUESTION 8 / VRAAG 8**8.1****(3)****Accepted labels / Aanvaarde benoemings**

F_G	W/ F_w / force of earth on / weight / mg / gravitational force / 0,0098N
F_E	Electrostatic force / Force of charge X on charge Y
T	Tension

Notes/Aantekeninge:

- Mark awarded for label and arrow./Punt toegeken vir benoeming en pyltjie.
- Any additional forces/Enige addisionele kragte: deduct 1 mark/trek 1 punt af: max/maks $\frac{2}{3}$
- No labels/Geen byskrifte: deduct 1 mark/trek 1 punt af: max/maks $\frac{2}{3}$
- If everything correct, but no arrows/As alles reg is, maar geen pyltjies nie: deduct 1 mark/trek 1 punt af: $\frac{2}{3}$
- Force(s) not touching object/Krag(te) raak nie die voorwerp nie: deduct 1 mark/trek 1 punt af: max/maks $\frac{2}{3}$
- Ignore relative sizes of the vectors/Ignoreer relatiewe groottes van vektore.

8.2

$$\tan 45^\circ = \frac{F_e}{F_g} \quad \checkmark = \frac{F_e}{0,01 \times 9,8} \quad \checkmark$$

$$F_e = 8,37 \times 10^{-2} \text{ N} \quad \checkmark$$

(3)

8.3

POSITIVE MARKING FROM QUESTION 8.2
POSITIEWE MERK VANAF VRAAG 8.2

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

$$8,37 \times 10^{-2} \checkmark = \frac{(9 \times 10^9)(Q)^2}{(0,05)^2} \checkmark$$

$$Q_1 = Q_2 = 1,52 \times 10^{-7} \text{ C } \checkmark$$

(4)
[10]**QUESTION 9 / VRAAG 9**

9.1

An electric field is an area in space where an electrical charge experiences a force. ✓✓ **(2 or 0)**

'n Elektriese veld is 'n gebied in die ruimte waarin 'n elektriese lading 'n krag ondervind.

(2 or 0)

(2)

9.2

Negative / Negatief ✓

(1)

9.3

$$E = \frac{kQ}{r^2} \checkmark$$

$$E_{\text{net}} = E_{Q1} + E_{Q2}$$

$$8600 \checkmark = \frac{(9 \times 10^9)(20 \times 10^{-6})}{(0,6)^2} \checkmark + \frac{(9 \times 10^9)(Q_2)}{(0,3)^2} \checkmark$$

$$Q_2 = (-) 4,9 \times 10^{-6} \text{ C } \checkmark$$

(5)

9.4

No ✓

Two like charges repel (do not attract) OR
Field lines direction away from positive charge ✓

Nee ✓

Twee soortgelyke ladings stoot af (trek nie mekaar aan nie) OF
Veldlyne se rigting is weg van positiewe lading ✓

(2)
[10]

QUESTION 10 / VRAAG 10

- 10.1 The potential difference over a resistor is directly proportional to the current flow in the resistor provided that the temperature remains constant. ✓✓
(2 or 0)
Die potensiaalverskil oor 'n geleier is direk eweredig aan die stroom in die geleier by konstante temperatuur. **(2 of 0)** (2)
- 10.2 Potential difference is measured. / Potensiaalverskil is gemeet. ✓
Resistance high, low current flow. / Weerstand hoog, lae stroomvloeï. ✓ (2)
- 10.3.1
$$\frac{1}{R_{||}} = \frac{1}{R_1} + \frac{1}{R_2} \checkmark$$
$$= \frac{1}{5} + \frac{1}{10} \checkmark$$
$$R = 3,33 \, \Omega \checkmark$$
 (3)
- 10.3.2 **POSITIVE MARKING FROM QUESTION 10.3.1**
POSITIEWE MERK VANAF VRAAG 10.3.1
$$\mathcal{E} = I(R + r) \checkmark$$
$$20 \checkmark = \underline{1,65 (3,33 + R_1 + 0,5)} \checkmark$$
$$R_1 = 8,29 \, \Omega \checkmark$$
 (4)
- 10.3.3 **POSITIVE MARKING FROM Q10.3.1 & Q10.3.2**
POSITIEWE MERK VANAF V10.3.1 & V10.3.2
- | OPTION 1/OPSIE 1 | OPTION 2/OPSIE 2 |
|---|---|
| Ratio current 2:1 ✓
$\frac{2}{3}$ of 1,65 A ✓
$I = 1,1 \, A \checkmark$ | $I = \frac{V_P}{R} \checkmark$
$I = \frac{5,495}{5} \checkmark$
$I = 1,1 \, A \checkmark$ |
- (3)

10.3.4	POSITIVE MARKING FROM QUESTION 10.3.1 – 10.3.3 POSITIEWE MERK VANAF VRAAG 10.3.1 – 10.3.3	
	OPTION 1/OPSIE 1 $W = I^2 R \Delta t \checkmark$ $= (1,65)^2 (1) (90) \checkmark$ $= 245,03 \text{ J} \checkmark$	
	OPTION 2/OPSIE 2 $W = \frac{V^2}{R} \Delta t \checkmark$ $P = \frac{1,65^2}{1} (90) \checkmark$ $P = 245,03 \text{ J} \checkmark$	
	OPTION 3/OPSIE 3 $W = VI \Delta t \checkmark$ $= (1,65) (1,65) (90) \checkmark$ $= 245,03 \text{ J} \checkmark$	(3)

10.4.1 Decreases/Afneem $\checkmark$ (1)

- 10.4.2
- Total resistance increases $\checkmark$
 - V_{int} decreases $\checkmark$
 - Totale weerstand neem toe $\checkmark$
 - V_{int} neem af $\checkmark$
- (2)

TOTAL/TOTAAL [20]
150