



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE/
NASIONALE
SENIOR SERTIFIKAAT**

GRADE/GRAAD 10

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

NOVEMBER 2016

MEMORANDUM

MARKS/PUNTE: 150

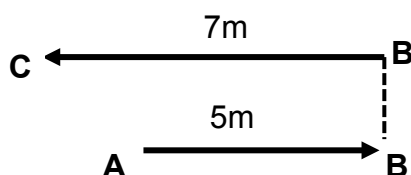
**This memorandum consists of 13 pages.
*Hierdie memorandum bestaan uit 13 bladsye.***

QUESTION 1/VRAAG 1

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

QUESTION 2/VRAAG 2

2.1



Mark allocation/Puntetoekenning:

- ✓ 1 x line AB: length, arrow, label
1 x lyn AB: lengte, rigting, benoem
- ✓ 1 x line BC: length, arrow, label
1 x lyn BC: lengte, rigting, benoem

- 2.2 2 m ✓ to the left ✓
2 m links (2)
- 2.3 Total distance/Totale afstand
= 5 + 7 ✓
= 12 m ✓ (2)
- 2.4 For the total distance, the whole path length travelled is considered. ✓
For change in position, only the original position and final position ✓ of the man are considered.
Vir die totale afstand word die totale padlengte afgelê in berekening gebring, maar slegs die begin- en eindposisie word in berekening gebring vir verandering in posisie. (2)
- 2.5 Velocity is the rate ✓ of change of displacement. ✓
Snelheid is die tempo waarteen verplasing (verandering in posisie) verander. (2)

2.6 $v = \frac{\Delta x}{\Delta t} \checkmark$
 $= \frac{2}{20} \checkmark$
 $= 0,1 \text{ m}\cdot\text{s}^{-1} \checkmark$ west/to the left \checkmark
 wes/na links

(4)
[14]

QUESTION 3/VRAAG 3

3.1 Acceleration is the rate \checkmark of change of velocity. \checkmark
Versnelling is die tempo van snelheidsverandering.

OR/OF

Acceleration is the change in velocity \checkmark per unit time \checkmark .
Versnelling is die verandering in snelheid per tydseenheid.

(2)

3.2 No \checkmark
 Nee

(1)

3.3 Velocity to the right, acceleration to the left \checkmark
Snelheid na regs, versnelling na links.

OR/OF

Taxi slowing down so acceleration is in opposite direction \checkmark to movement.
Die taxi beweeg stadiger, dus is versnelling in die teenoorgestelde rigting van beweging.

(1)

3.4

OPTION 1/OPSIE 1	OPTION 2/OPSIE 2
$\Delta x = v_i t + \frac{1}{2} a \Delta t^2 \checkmark$ $= 25 \times 1 \checkmark + \frac{1}{2} \times 0 \times 1^2 \checkmark$ $= 25 \text{ m} \checkmark$	$\Delta x = \frac{(v_f + v_i)}{2} \Delta t \checkmark$ $= \frac{25 + 25}{2} \checkmark \times 1 \checkmark$ $= 25 \text{ m} \checkmark$
OPTION 3/OPSIE 3	
$\Delta x = \frac{\Delta x}{\Delta t} \checkmark$ $25 \checkmark = \frac{\Delta x}{1} \checkmark$ $\Delta x = 25 \text{ m} \checkmark$	

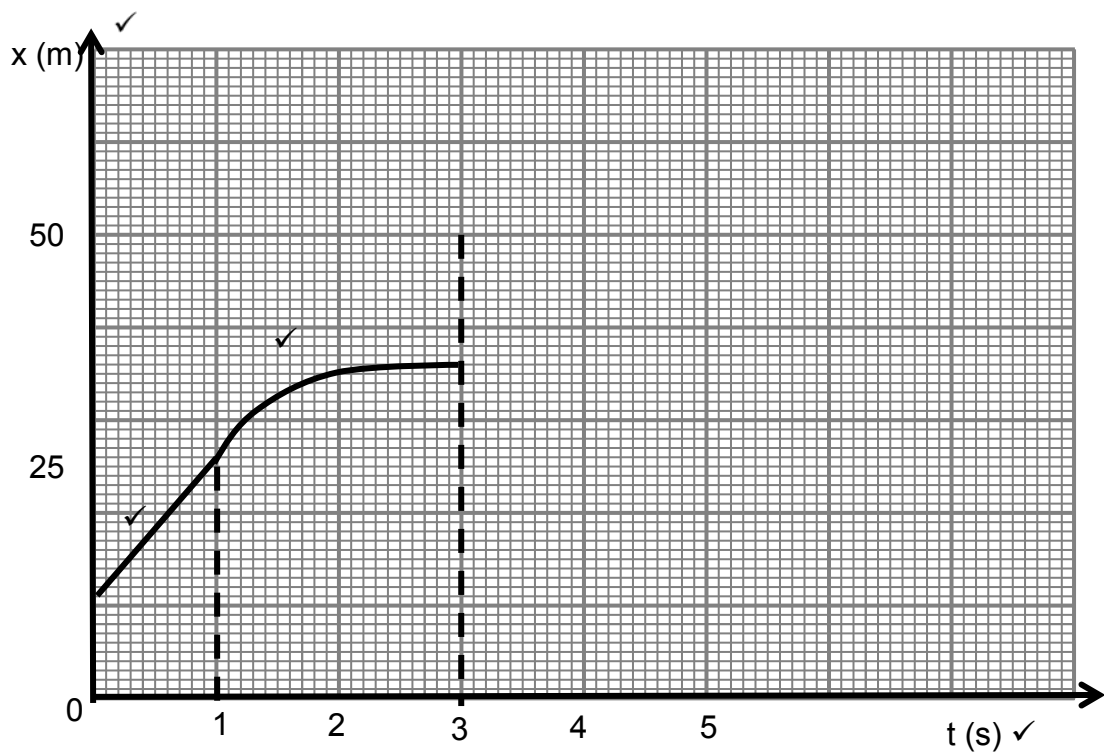
(4)

3.5 **POSITIVE MARKING FROM 3.4**
POSITIEWE NASIEN VANAF 3.4

OPTION 1/OPSIE 1	OPTION 2/OPSIE 2
$\Delta x = \left(\frac{v_f + v_i}{2} \right) \Delta t \checkmark$ $= \frac{(0+25)}{2} \times 2 \checkmark$ $= 25 \text{ m}$ <p>\therefore total distance/<i>totale afstand</i> $= 25 + 25 \checkmark$ $= 50 \text{ m} \checkmark$</p> <p>$\therefore$ taxi will not stop at the traffic light as distance $> 40 \text{ m} \checkmark$ \therefore <i>die taxi sal nie by verkeerslig stop nie, want die afstand is $> 40 \text{ m}$</i></p>	$v_f = v_i + a\Delta t \checkmark$ $a = \frac{v_f - v_i}{\Delta t}$ $a = \frac{(0 - 25)}{2} \checkmark$ $= -12,5 \text{ m} \cdot \text{s}^{-2}$ <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> Only one mark for either equation <i>Slegs een punt vir die enige een van die vergelykings.</i> </div> $v_f^2 = v_i^2 + 2a\Delta x$ $0 = 25^2 + 2 \times -12,5 \times \Delta x \checkmark$ $\therefore \Delta x = 25 \text{ m}$ <p>\therefore total distance/<i>totale afstand</i> $= 25 + 25$ $= 50 \text{ m} \checkmark$</p> <p>$\therefore$ taxi will not stop at the traffic light as distance $> 40 \text{ m} \checkmark$ \therefore <i>die taxi sal nie by verkeerslig stop nie, want die afstand is $> 40 \text{ m}$</i></p>
OPTION 3/OPSIE 3	
$a = \frac{v_f - v_i}{\Delta t} \checkmark$ $= \frac{(0 - 25)}{2} \checkmark$ $= -12,5 \text{ m} \cdot \text{s}^{-2}$ $\Delta x = v_i t + \frac{1}{2} a \Delta t^2$ $= 25 \times 2 + \frac{1}{2} \times -12,5 \times 2^2 \checkmark$ $= 25 \text{ m}$ <p>\therefore total distance/<i>totale afstand</i> $= 25 + 25$ $= 50 \text{ m} \checkmark$</p> <p>$\therefore$ taxi will not stop at the traffic light, as distance $> 40 \text{ m} \checkmark$ \therefore <i>die taxi sal nie betyds stop nie, want die afstand is $> 40 \text{ m}$</i></p> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> Only one mark for either equation <i>Slegs een punt vir enige een van die vergelykings.</i> </div>	

(5)

3.6



MARKING GUIDELINES/NASIENRIGLYNE

- ✓ Both axes correctly labelled
Beide asse korrek benoem
- ✓ Straight line ($t = 0$ s and $t = 1$ s)
Reguitlyn ($t = 0$ s en $t = 1$ s)
- ✓✓ Curve shape ($t = 1$ s and $t = 3$)
Kurwe ($t = 1$ s en $t = 3$)

(4)
[17]

QUESTION 4/VRAAG 4

4.1 $5 \text{ m}\cdot\text{s}^{-1}$ ✓ north ✓ (accept range from 4,5 to 4,9)
 $5 \text{ m}\cdot\text{s}^{-1}$ noord (aanvaar vanaf 4,5 tot 4,9) (2)

4.2 $8,4 \text{ m}\cdot\text{s}^{-1}$ ✓✓ (accept range from 8,2 to 8,6)
 $8,4 \text{ m}\cdot\text{s}^{-1}$ (aanvaar vanaf 8,2 tot 8,6) (2)

4.3.1

- The velocity is uniformly increasing.
- Velocity increases from $5 \text{ m}\cdot\text{s}^{-1}$ to $10 \text{ m}\cdot\text{s}^{-1}$ in 350 s.
- Positive acceleration.
- The girl is speeding up.

Any **ONE** of the options ✓✓
 Enige **EEN** korrekte opsie

- *Snelheid neem uniform toe.*
- *Snelheid neem van $5 \text{ m}\cdot\text{s}^{-1}$ tot $10 \text{ m}\cdot\text{s}^{-1}$ in 350 s toe.*
- *Positiewe versnelling.*
- *Die meisie se spoed neem toe.*

(2)

4.3.2

- Uniform/constant velocity
- No acceleration
- Same speed

Any **ONE** of the options ✓✓
 Enige **EEN** korrekte opsie

- *Uniforme/konstante snelheid*
- *Geen versnelling*
- *Dieselfde spoed*

(2)

OPTION 1/OPSIE 1	OPTION 2/OPSIE 2
Distance A to C <i>Afstand A tot C</i> $= l \times b + \frac{1}{2} \times b \times h$ ✓ $= \underline{5 \times 350} \checkmark + \underline{\frac{1}{2} \times 150 \times 5} \checkmark$ $= 2\ 125 \text{ m}$ ✓	Distance A to C <i>Afstand A tot C</i> $= l \times b + l \times b + \frac{1}{2} \times b \times h$ ✓ $= \underline{200 \times 5} + \underline{150 \times 5} \checkmark + \frac{1}{2} \times 150 \times 5 \checkmark$ $= 2\ 125 \text{ m}$ ✓

OPTION 3/OPSIE 3
Distance A to C <i>Afstand A tot C</i> $= l \times b + \frac{1}{2} (\text{sum of parallel sides}) h$ ✓ $= l \times b + \frac{1}{2} (\text{som van parallele sye}) h$ ✓ $= \underline{5 \times 200} \checkmark + \underline{\frac{1}{2} (5 + 10)(150)} \checkmark$ $= 2\ 125 \text{ m}$ ✓

(4)

4.4.2

$$a = \frac{v_f - v_i}{\Delta t} \checkmark$$

$$= \frac{(0 - 10)}{50} \checkmark$$

$$= -0,2 \text{ m}\cdot\text{s}^{-2}$$

$\therefore a = 0,2 \text{ m}\cdot\text{s}^{-2}$ South ✓
 Suid

(4)

- 4.5 D to E. ✓✓
D tot E (2)
- 4.6 The change in speed from D to E is $(-10 \text{ m}\cdot\text{s}^{-1})$ ✓ and that occurs over (50 s) a shorter period. ✓
OR
From B to C, the change in speed is $5 \text{ m}\cdot\text{s}^{-1}$ over a period of 150 s. ✓✓
OR
Gradient is the steepest
Die verandering is spoed van D tot E is $(-10 \text{ m}\cdot\text{s}^{-1})$ ✓ en die beweging gebeur oor 'n korter tydperk. ✓
OF
Vanaf B tot C is die verandering in spoed $5 \text{ m}\cdot\text{s}^{-1}$ oor 'n tydperk van 150 s.
OF
Gradient is die steilste (2)

[20]

QUESTION 5/VRAAG 5

- 5.1 $14 (\text{m}\cdot\text{s}^{-1}) \times \frac{3600}{1000}$ ✓
 $= 50,4 \text{ km}\cdot\text{h}^{-1}$ ✓
OR/OF
 $14 (\text{m}\cdot\text{s}^{-1}) \times 3,6$ ✓
 $= 50,4 \text{ km}\cdot\text{h}^{-1}$ ✓ (2)
- 5.2 The energy an object possesses as a result of its motion. ✓✓
Die energie van 'n voorwerp as gevolg van die beweging daarvan. (2)
- 5.3 $E_p = mgh$ ✓
 $= 0,01 \times 9,8 \times 5$ ✓
 $= 0,49 \text{ J}$ ✓ (3)
- 5.4 $(E_p + E_k)_{\text{top/bo}} = (E_p + E_k)_{\text{bottom/onder}}$ } ✓
 $mgh + 0 = mgh + \frac{1}{2}mv^2$ } ✓
 $(0,01)(9,8)(10)$ ✓ $= \frac{(0,01)(9,8)(5)}{v} + \frac{1}{2} \times 0,01 \times v^2$ ✓
 $v = 9,89 \text{ m}\cdot\text{s}^{-1}$ ✓ (4)
- 5.5 Equal to ✓. Mechanical energy is conserved ✓, it is a closed system. ✓
Gelyk aan. Meganiese energie word behou, dit is 'n geslote stelsel. (3)

[14]

QUESTION 6/VRAAG 6

6.1 0,4 m ✓✓ (2)

6.2.1 Trough✓
Trog/buik (1)

6.2.2 Crest✓
Kruin (1)

6.3 A and C✓
A en C (1)

6.4 $2\frac{1}{2}$ ✓✓ (2)

6.5 $v = f \times \lambda$ ✓
 $0,4 = 0,5 \times \lambda$ ✓
 $\therefore \lambda = 0,8\text{m}$ ✓ (3)

6.6 $2\frac{1}{2} \times 0,8$ ✓
 $= 2\text{ m}$ ✓

OR/OF

$$v = \frac{d}{t}$$
$$0,4 = \frac{d}{5}$$
$$= 2\text{ m} \checkmark$$

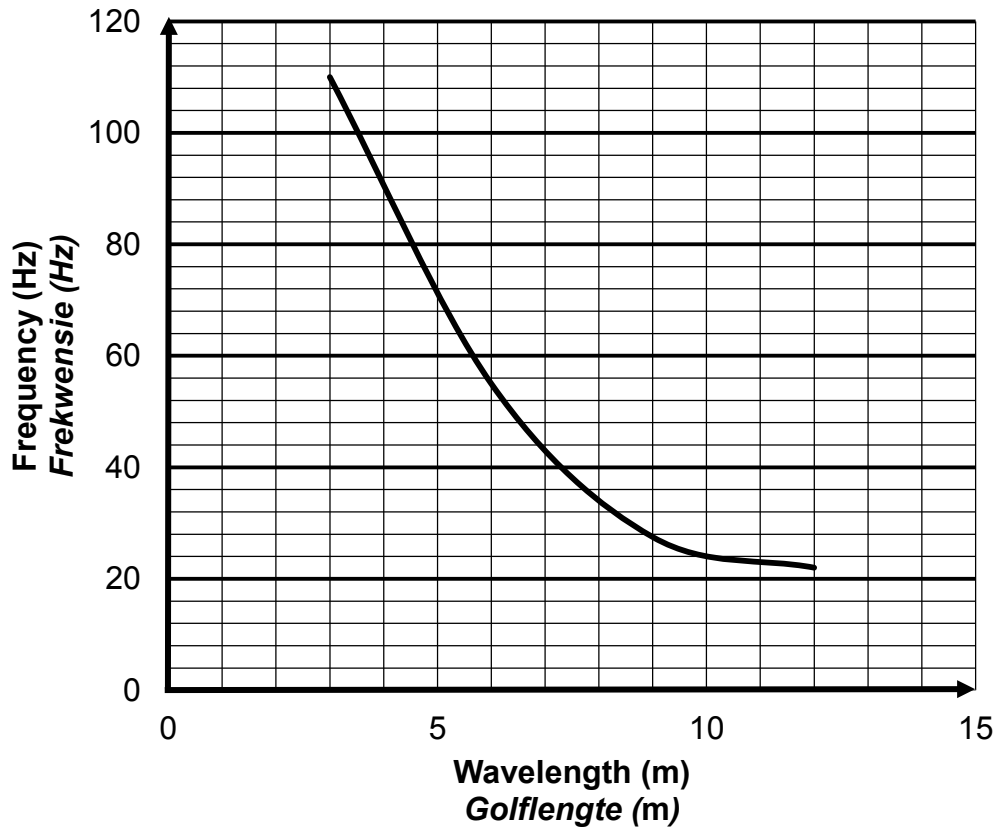
(2)
[12]

QUESTION 7/VRAAG 7

7.1 The notes played. ✓
 Die note gespeel (1)

7.2 The frequency OR wavelength of each note. ✓
 Die frekwensie OF golflengte van elke noot (1)

7.3



MARK ALLOCATION:

- ✓ 1 x correct y-axis label and unit
- ✓ 1 x correct x-axis label and unit
- ✓ 1 x points plotted and joined
- ✓ 1 x shape of graph

PUNTETOEKENNING:

- ✓ 1 x korrekte benoeming en eenheid op y-as
- 1 x korrekte benoeming en eenheid op x-as
- ✓✓ 2 x punte korrek gestip en verbind
- ✓ 1 x vorm van grafiek

(4)

7.4 Frequency and wavelength are inversely proportional ✓ to each other.
 Frekwensie en golflengte is omgekeerd eweredig aan mekaar. (1)

7.5 $v = f \times \lambda$ ✓
 $= 55 \times 6$ ✓
 $= 330 \text{ m} \cdot \text{s}^{-1}$ ✓ (3)
[10]

QUESTION 8/VRAAG 8

- 8.1.1 C ✓
8.1.2 A ✓
8.1.3 B ✓ (3)

- 8.2.1
- Keeping food warm
 - Remote controls
 - Optical fibres ✓
 - Animals like snakes which hunt
 - Infrared scanners for picking up heat

Any ONE ✓/Enige een

- *Hou voedsel warm*
- *Afstandbeheerders*
- *Optiese vesels*
- *Sekere diere soos slange wat jag*
- *Infrarooi skandeerders wat hitte optel*

(1)

- 8.2.2
- Telephone OR satellite OR cellphone connections
 - RADAR systems ✓
 - RADAR speed traps
 - Microwave ovens

Any ONE ✓/Enige een

- *Telefoon- OF satelliet- OF selfoonkonneksies*
- *RADARstelsels*
- *RADARspoedlokvalstelsels*
- *Mikrogolfoonde*

(1)

- 8.3.1 X-ray ✓
X-strale

(1)

- 8.3.2 X-ray has a high frequency and can penetrate into soft tissues of humans, ✓
but not bones.
X-strale het 'n hoë frekwensie en kan in die sagte weefsel van mense indring, maar nie been nie.

(1)

- 8.3.3 X-rays can:
- damage living tissue
 - cause cancer
- X-strale kan:*

Any ONE ✓/Enige een

- *weefsel beskadig*
- *kanker veroorsaak*

(1)

- 8.4
- $$E = h \frac{c}{\lambda} \checkmark$$
- $$= 6,63 \times 10^{-34} \checkmark \times \frac{3 \times 10^8}{3} \checkmark$$
- $$= 6,63 \times 10^{-26} \text{ J } \checkmark$$

(4)

[12]

QUESTION 9/VRAAG 9

9.1.1 A force exerted on an object without touching the object. ✓✓

OR

A force exerted on an object that is at a distance. ✓✓

'n Krag wat op 'n voorwerp uitgeoefen word sonder om aan die voorwerp te raak.

OF

'n Krag wat oor 'n afstand op 'n voorwerp uitgeoefen word.

(2)

- 9.1.2
- Gravity/Weight/Gravitational force ✓
 - Electrostatic/Coulombic force

Any ONE ✓/Enige een

- *Gravitasiekrag/Gewig/Gravitasie*
- *Elektrostatiese/Coulomb-kragte*

(1)

9.2 Attractive ✓
Aantrekkend

(1)

- 9.3
- North ✓
 - The direction of magnetic field lines is from north to south ✓✓

- *Noord*
- *Die rigting van magneetveldlyne is van noord na suid*

(3)

[7]

QUESTION 10/VRAAG 10

10.1 B ✓ (1)

10.2 B to A ✓
 B tot A (1)

10.3
$$Q_{\text{new/nuut}} = \frac{Q_1 + Q_2}{2} \checkmark$$

$$= \frac{(+3 \times 10^{-6} + (-2 \times 10^{-6}))}{2} \checkmark$$

$$= 5 \times 10^{-7} \text{C} \checkmark$$
 (3)

OPTION 1/OPSIE 1	OPTION 2/OPSIE 2
$n = \frac{Q}{e} \checkmark$ $= \frac{5 \times 10^{-7} - (-2 \times 10^{-6})}{-1,6 \times 10^{-19}} \checkmark$ $= 1,56 \times 10^{13} \text{ electrons} \checkmark$ <p style="text-align: center;"><i>elektrone</i></p>	$n = \frac{Q}{e} \checkmark$ $= \frac{5 \times 10^{-7} - (+3 \times 10^{-6})}{-1,6 \times 10^{-19}} \checkmark$ $= 1,56 \times 10^{13} \text{ electrons} \checkmark$ <p style="text-align: center;"><i>elektrone</i></p>

(3)
[8]

QUESTION 11/VRAAG 11

OPTION 1/OPSIE 1	OPTION 2/OPSIE 2
$\frac{1}{R_{//}} = \frac{1}{R_1} + \frac{1}{R_2} \checkmark$ $= \frac{1}{6} + \frac{1}{3} \checkmark$ $\therefore R_{//} = 2\Omega$ $\therefore R_{\text{total/totaal}} = 4 + 2 \checkmark$ $= 6 \Omega \checkmark$	$R_{//} = \frac{R_1 \times R_2}{R_1 + R_2} \checkmark$ $= \frac{6 \times 3}{6+3} \checkmark$ $= 2\Omega$ $\therefore R_{\text{total/totaal}} = 4 + 2 \checkmark$ $= 6 \Omega \checkmark$

(4)

11.1.2
$$R_{4\Omega} = \frac{V_2}{I_T} \checkmark$$

$$4 = \frac{V_2}{2} \checkmark$$

$$\therefore V_2 = 8 \text{ V} \checkmark$$
 (3)

11.1.3	OPTION 1/OPSIE 1	OPTION 2/OPSIE 2
	$I = \frac{V}{R} \checkmark$ $= \frac{12 - 8}{6} \checkmark$ $= 0,67 \text{ A} \checkmark$	$R \propto \frac{1}{I} \checkmark$ or in words: resistance is inversely proportional to current and \therefore ratio of resistors is 6 : 3 $2 : 1$ \therefore ratio of current is 1 : 2 \checkmark $A_2 : A_3$ $\therefore I_{A2} = \frac{2}{3} \times 1$ $\therefore I_{A2} = 0,67 \text{ A} \checkmark$ $R \propto \frac{1}{I} \checkmark$ in woorde: weerstand is omgekeer eweredig aan stroom \therefore verhouding van resistors is 6 : 3 $2 : 1$ \therefore verhouding van stroom is 1 : 2 \checkmark $A_2 : A_3$ $\therefore I_{A2} = \frac{2}{3} \times 1$ $\therefore I_{A2} = 0,67 \text{ A} \checkmark$

(3)

11.1.4 $A_1 = 2 \text{ A}$
 $\therefore Q = I \Delta t \checkmark$
 $= 2 \times 120 \checkmark$
 $= 240 \text{ C} \checkmark$

(3)

11.2 Decrease \checkmark
 Afneem

(1)

- 11.3
- If the 6 Ω resistor is removed, the resistance of the whole circuit increases \checkmark
 - Since $R \propto \frac{1}{I}$, if R increases, and V is constant \checkmark and I of the circuit decreases \checkmark
 - *Indien die 6 Ω -resistor verwyder word, sal die totale weerstand van die stroombaan verhoog.*
 - $R \propto \frac{1}{I}$, so indien R verhoog en V bly konstant, sal die stroom (I) verlaag.

(3)

[17]

TOTAL/TOTAAL: 150