



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE/
NASIONALE
SENIOR SERTIFIKAAT**

GRADE/GRAAD 10

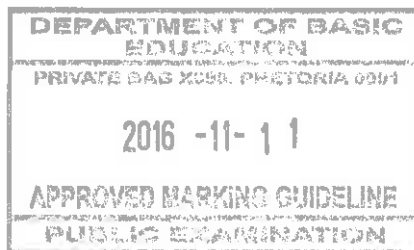
**PHYSICAL SCIENCES: PHYSICS (P1)
FISIESE WETENSKAPPE: FISIKA (V1)**

NOVEMBER 2016

MEMORANDUM

MARKSIPUNTE: 150

**This memorandum consists of 14 pages.
Hierdie memorandum bestaan uit 14 bladsye.**



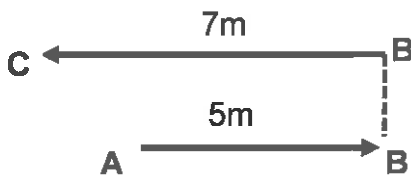
J. Jones 12/11
B. 12/11

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/Puntetoekening:

- ✓ 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 2 m ✓ west/to the left ✓
2 m ✓ wes/na links ✓

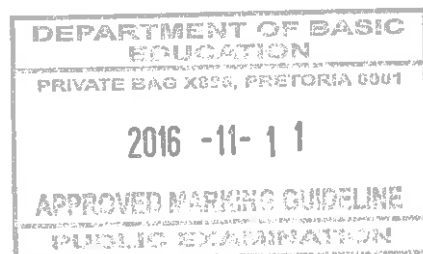
(2)

OR

If the learner has done 2.2 on the vector diagram above, allocate 1 mark for the resultant from A to C ✓ and 1 mark for the label of the magnitude of 2m. ✓

As leerder 2.2 op die bostaande vektordiagram aangedui het, ken 1 punt vir die resultant van A tot C toe, en 1 punt vir die benoeming van 2m

- 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. (2)
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.

- 2.5 Velocity is the rate of change of displacement. ✓✓
Snelheid is die tempo waarteen verplasing (verandering in posisie) verander. (2)

ACCEPT:

Change in displacement over change in time

AANVAAR:

Verandering in verplasing gedeel deur verandering in tyd

- 2.6 **POSITIVE MARKING FROM 2.2**
POSITIEWE NASIEN VANAF 2.2

$$v = \frac{\Delta x}{\Delta t} \checkmark$$

$$= \frac{2 \checkmark}{20 \checkmark}$$

$$= 0,1 \text{ m} \cdot \text{s}^{-1} \text{ west/to the left} \checkmark$$

wes/na links

(4)
[14]**QUESTION 3/VRAAG 3**

- 3.1 Acceleration is the rate of change of velocity. ✓✓
Versnelling is die tempo van snelheidsverandering.

OR/OF

Acceleration is the change in velocity per unit time ✓✓.

Versnelling is die verandering in snelheid per tydseenheid. (2)

- 3.2 No ✓
Nee (1)

- 3.3 **NEGATIVE MARKING FROM 3.2**
NEGATIEWE MERK VANAF 3.2

Velocity to the right, acceleration to the left ✓
*Snelheid na regs, versnelling na links.***OR/OF**Taxi slowing down so acceleration is in opposite direction ✓ to movement.*Die taxi beweeg stadiger, dus is versnelling in die teenoorgestelde rigting van beweging.**NE*
(1)

3.4

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

(4)



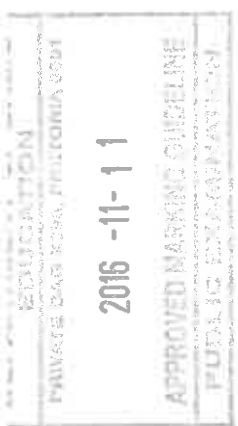
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3.5 **POSITIVE MARKING FROM 3.4**
POSITIEWE NASIEN VANAF 3.4

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/totale afstand $= 25 + 25 \checkmark$ $= 50 \text{ m} \checkmark$</p> <p>$\therefore$ <u>taxi will not stop</u> at the traffic light as distance > 40 m \therefore <u>die taxi sal nie</u> \checkmark by verkeerslig stop nie, want die afstand is > 40 m</p> <p>OR / OF</p> $\Delta x = \left(\frac{v_f + v_i}{2} \right) \Delta t \checkmark$ $= \frac{(0+25)}{2} \times 2 \checkmark$ $= 25 \text{ m} \checkmark$ <p>\therefore distance available for braking time is $40 - 25 = 15 \text{ m}$, therefore the taxi is short of 10 m to stop. \checkmark \therefore <u>the taxi will not stop in time.</u> \checkmark \therefore <u>die beskikbare afstand vir breektyd is $40 - 25 = 15 \text{ m}$, dus sal die taxi 10 m te min hê om te stop.</u> \therefore <u>dus sal die taxi nie betyds stop nie</u></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 Slegs een punt vir die enige een van die vergelykings. </div> $v_f^2 = v_i^2 + 2a\Delta x$ $0 = 25^2 + 2 \times -12,5 \times \Delta x \checkmark$ <p>$\therefore \Delta x = 25 \text{ m}$ \therefore total distance/totale afstand $= 25 + 25$ $= 50 \text{ m} \checkmark$</p> <p>$\therefore$ <u>taxi will not stop</u> at the traffic light as distance > 40 m \checkmark \therefore <u>die taxi sal nie</u> by verkeerslig stop nie, want die afstand is > 40 m</p>
<p>OPTION 3/OPSIE 3</p> $a = \frac{v_f - v_i}{\Delta t} \checkmark$ $= \frac{(0 - 25)}{2} \checkmark$ $= -12,5 \text{ m} \cdot \text{s}^{-2}$ $\Delta x = v_i t + \frac{1}{2} a \Delta t^2$ $= 25 \times 2 + \frac{1}{2} \times -12,5 \times 2^2 \checkmark$ $= 25 \text{ m}$ <p>\therefore total distance/totale afstand $= 25 + 25$ $= 50 \text{ m} \checkmark$</p> <p>$\therefore$ <u>taxi will not stop</u> at the traffic light, as distance > 40 m \checkmark \therefore <u>die taxi sal nie betyds stop nie</u>, want die afstand is > 40 m</p>	<div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> Only one mark for either equation Slegs een punt vir enige een van die vergelykings. </div>

(5)

Jy NE



OPTION /OPSIE 4

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

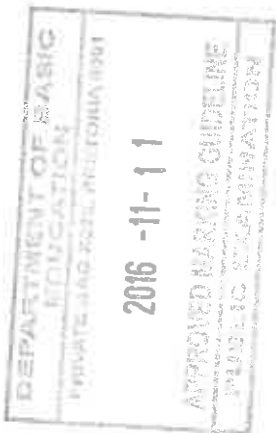
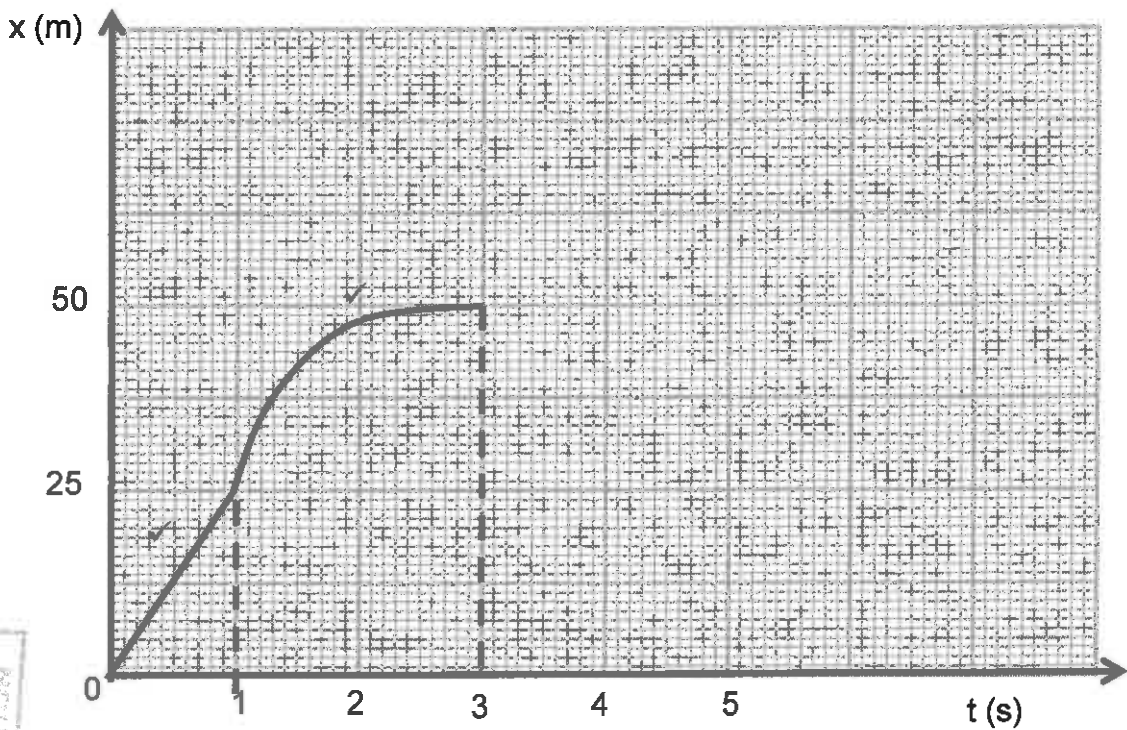
$$15 = \frac{25 + 0}{2} \checkmark \times \Delta t \checkmark$$

$$\Delta t = 1,2 \text{ s} \checkmark$$

Actual time to reach traffic light is 1,2s which is shorter than the 2s. Therefore the taxi will not stop in time. ✓

Eintlike tyd of verkeerslig te bereik is 1,2s wat korter is as 2s. Dus sal die taxi nie betyds stop nie.

3.6



MARKING GUIDELINES/NASIENRIGLYNE

- ✓ Both axes correctly labelled with unit
Beide asse korrek benoem met eenheid
- ✓ 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)
- ✓ values for displacement and time indicated
Waardes vir verplasing en tyd aangedui

By the
 (4)
 [17]

QUESTION 4/VRAAG 4

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

4.2 $8,3 \text{ m}\cdot\text{s}^{-1}$ ✓✓ (accept range from 8,2 to 8,4)
 $8,3 \text{ m}\cdot\text{s}^{-1}$ (aanvaar vanaf 8,2 tot 8,4) (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 150 s.
- Positive acceleration.
- The girl is speeding up.
- The girl is uniformly accelerating

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 150 s toe.*
- *Positiewe versnelling.*
- *Die meisie se speed neem toe.*
- *Die meisie se versnelling is uniform.* (2)

4.3.2

- Uniform/constant velocity
- Zero acceleration
- Same speed / velocity

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

- *Uniforme/konstante snelheid*
- *Nil versnelling*
- *Dieselfde speed/ snelheid* (2)

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

OPTION 3/OPSIE 3

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

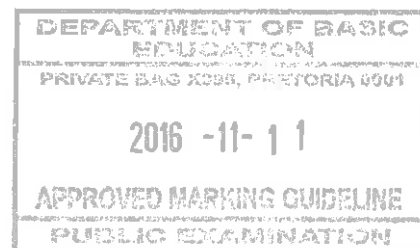
4.4.2 Gradient of this graph is the acceleration

$$\text{gradient} = \frac{y_2 - y_1}{x_2 - x_1} \text{ ✓ or } \frac{v_f - v_i}{t_f - t_i}$$

$$= \frac{(0 - 10) \text{ ✓}}{(65 - 0) \text{ ✓}}$$

$$= -0,15 \text{ m}\cdot\text{s}^{-2}$$

∴ $a = 0,15 \text{ m}\cdot\text{s}^{-2}$ South ✓ / Suid



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 (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 (65 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. (65 s) ✓

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 $14 \times \frac{3\,600}{1\,000}$ ✓
 $= 50,4 \text{ km}\cdot\text{h}^{-1}$ ✓

OR/OF

$14 \times 3,6$ ✓
 $= 50,4 \text{ km}\cdot\text{h}^{-1}$ ✓

(2)

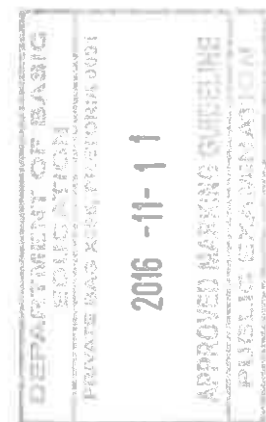
5.2 The energy an object possesses as a result of its motion. ✓✓
 Die energie van 'n voorwerp as gevolg van die beweging daarvan. (2)

5.3 $E_p = mgh$ ✓
 $= 0,01 \times 9,8 \times 5$ ✓
 $= 0,49 \text{ J}$ ✓

(3)

5.4	OPTION/OPSIE 1
	$(E_p + E_k)_{\text{top/bo}} = (E_p + E_k)_{\text{bottom/onder}}$ ✓ $mgh + \frac{1}{2}mv^2 = mgh + \frac{1}{2}mv^2$ ✓ $(0,01)(9,8)(10) + 0 = (0,01)(9,8)(5) + \frac{1}{2} \times 0,01 \times v^2$ ✓ $v = 9,89 \text{ m}\cdot\text{s}^{-1}$ ✓
	OPTION/OPSIE 2
	$(E_p + E_k)_{\text{top/bo}} = (E_p + E_k)_{\text{bottom/onder}}$ ✓ $mgh + \frac{1}{2}mv^2 = mgh + \frac{1}{2}mv^2$ ✓ $(0,01)(9,8)(10) + 0 = 0,49 + \frac{1}{2} \times 0,01 \times v^2$ ✓ $v = 9,89 \text{ m}\cdot\text{s}^{-1}$ ✓

ACCEPT/ AANVAAR:
 $(E_p + E_k)_i = (E_p + E_k)_f$



J. S. Ne
 (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]

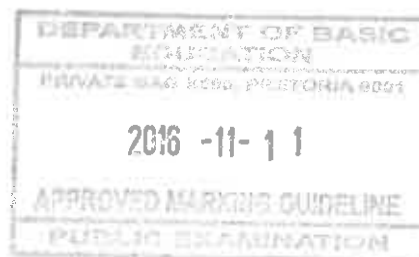
QUESTION 6/VRAAG 6

- 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 2½ ✓✓ (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

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

(2)
[12]



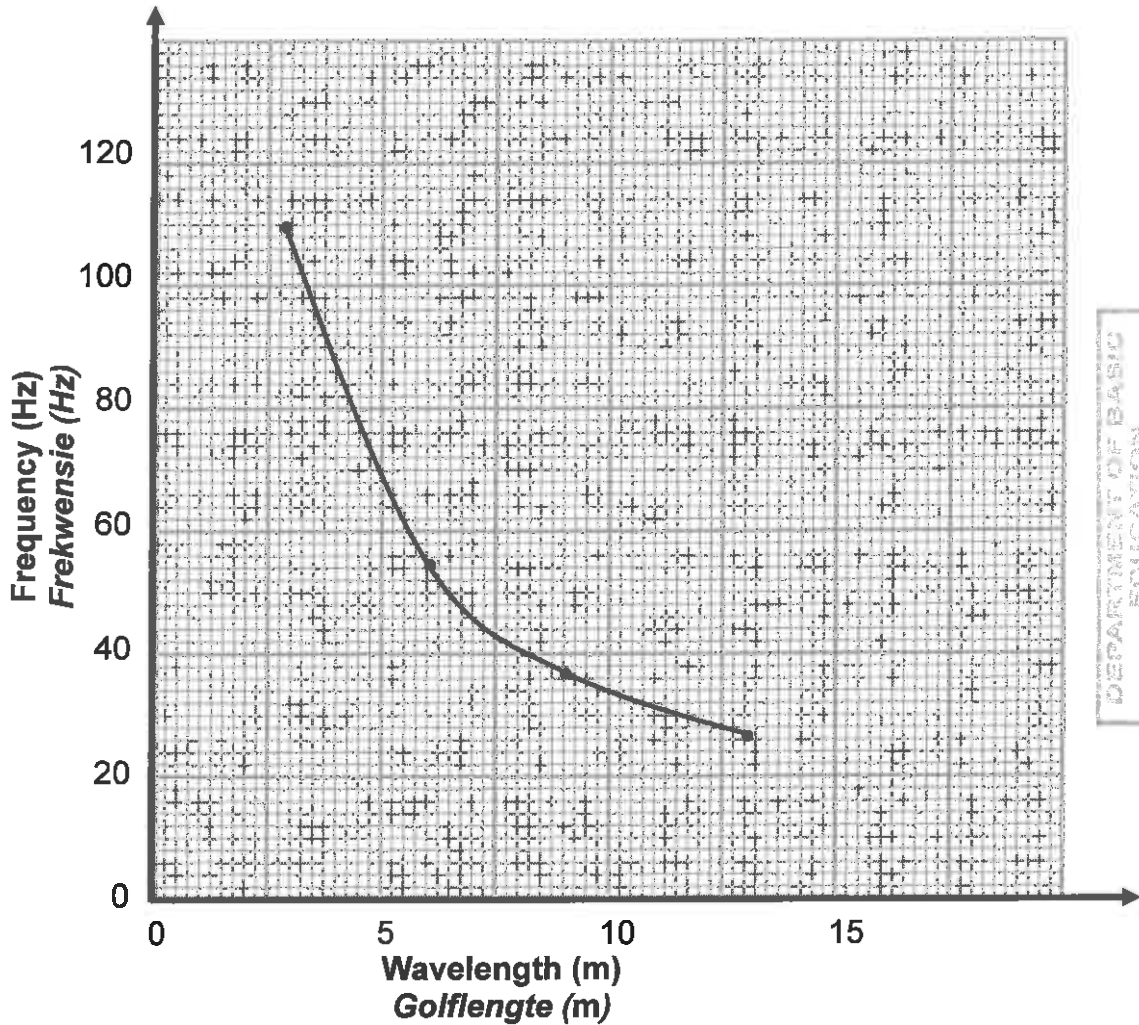
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QUESTION 7/VRAAG 7

7.1 The wavelength of notes (played). ✓
 Die golflengte van note (gespeel) (1)

7.2 The frequency. ✓
 Die frekwensie (1)

7.3



DEPARTMENT OF BASIC EDUCATION
 REPUBLIC OF SOUTH AFRICA, PRETORIA 0001
 2016 -11- 1 1
 APPROVED MARKING GUIDELINE

MARK ALLOCATION:

- ✓ correct y-axis label and unit
- ✓ correct x-axis label and unit
- ✓ all points plotted correctly
- And best fit line drawn
- ✓ shape of graph
- ✓ correct scales on axes

PUNTETOEKENNING:

- ✓ korrekte benoeming en eenheid op y-as
- ✓ korrekte benoeming en eenheid op x-as
- ✓ alle punte korrek gestip en beste lyn geteken
- ✓ vorm van grafiek
- ✓ korrekte skaal vir asse

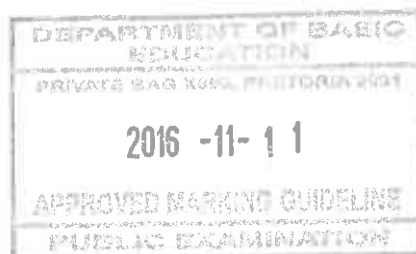
(4)

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

OR
 $f \propto \frac{1}{\lambda}$

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 (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*
- *RADARspoedlokalstelsels*
- *Mikrogolfoonde*

(1)

8.3.1 X-ray ✓
X-strale

(1)

8.3.2 X-ray has a high frequency OR (high) penetration into soft tissues of humans, ✓
but not bones.
X-strale het 'n hoë frekwensie OF sagte weefsel van mense (hoog)indring, maar nie been nie.

(1)

8.3.3 X-rays can:

- damage living tissue
- cause cancer

Any ONE ✓ / Enige een

- X-strale kan:
- *weefsel beskadig*
 - *kanker veroorsaak*

ly ke
(1)

8.4

OPTION/OPSIE 1	OPTION/OPSIE 2
$E = h \frac{c}{\lambda} \checkmark$ $= 6,63 \times 10^{-34} \checkmark \times \frac{3 \times 10^8}{3} \checkmark$ $= 6,63 \times 10^{-26} \text{ J} \checkmark$	$f = \frac{c}{\lambda}$ $= \frac{3 \times 10^8}{3} \checkmark$ $= 1 \times 10^8 \text{ Hz}$ $E = hf \checkmark$ (one mark for both equations/ een punt vir albei vergelykings) $= 6,63 \times 10^{-34} \times 1 \times 10^8 \checkmark$ $= 6,63 \times 10^{-26} \text{ J} \checkmark$

(4)
[12]

QUESTION 9/VRAAG 9

9.1.1 A force exerted on an object without touching the object. $\checkmark\checkmark$

OR

A force exerted on an object that is at a distance. $\checkmark\checkmark$ *'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 \checkmark
 - Electrostatic/Coulombic force

Any ONE \checkmark /Enige een

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

(1)

9.2 Attractive \checkmark
Aantrekkend

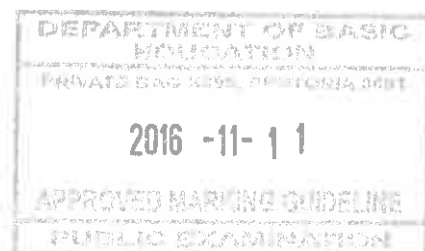
(1)

- 9.3
- North / N \checkmark
 - The direction of magnetic field lines is from north to south \checkmark

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

(2)

[6]



lyne

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
$n = \frac{Q}{e} \checkmark$ $= \frac{5 \times 10^{-7} - (-2 \times 10^{-8})}{1,6 \times 10^{-19}} \checkmark$ $= 1,56 \times 10^{13} \text{ electrons} \checkmark$ <p style="text-align: center;"><i>elektrone</i></p>	$n = \frac{Q}{e} \checkmark$ $= \frac{5 \times 10^{-7} - (+3 \times 10^{-8})}{-1,6 \times 10^{-19}} \checkmark$ $= 1,56 \times 10^{13} \text{ electrons} \checkmark$ <p style="text-align: center;"><i>elektrone</i></p>

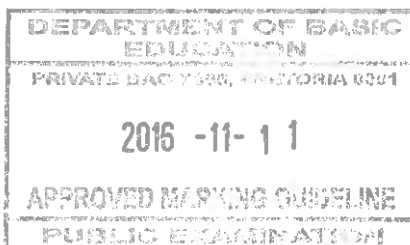
(3)
[8]

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)

<p>11.1.2 $R_{//} : R_{\text{series}}$ $2\Omega : 4\Omega \checkmark$ \therefore potential difference is also in ratio of <i>Potensiaal verskil is ook in die verhouding</i> 2: 4 or 1:2 ✓ $\therefore 12\text{V} \div 3 \text{ parts/dele} = 4\text{V}$ $\therefore V_{\text{series}} = 2 \times 4 = 8\text{V} \checkmark$</p>	<p>ACCEPT/ AANVAAR: $R_{4\Omega} = \frac{V_2}{I_T} \checkmark$ $4 = \frac{V_2}{2} \checkmark$ $\therefore V_2 = 8\text{V} \checkmark$</p>
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(3)
lyne

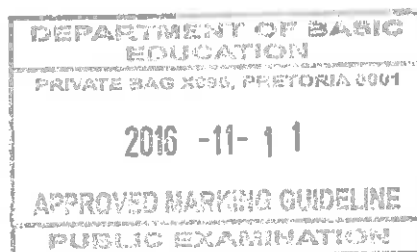
11.1.3	<p>$R \propto \frac{1}{I}$ or in words: resistance is inversely proportional to current and \therefore ratio of resistors is 6 : 3 ✓ 2 : 1</p> <p>\therefore ratio of current is 1 : 2 ✓ $A_2 : A_3$</p> <p>$\therefore I_{A2} = \frac{2}{3} \times 1$ $\therefore I_{A2} = 0,67 \text{ A} \quad \checkmark$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

- 11.3 **NEGATIVE MARKING FROM 11.2**
NEGATIEWE MERK VANAF 11.2
- If the 6Ω resistor is removed, the resistance of the whole circuit increases ✓
 - Since $R \propto \frac{1}{I} \checkmark$, if R increases, and V is constant ✓ and I of the circuit decreases
 - *Indien die 6Ω -resistor verwyder word, sal die totale weerstand van die stroombaan verhoog.*
 - $R \propto \frac{1}{I} \checkmark$, so indien R verhoog en V bly konstant ✓, sal die stroom (I) verlaag. (3)
- [17]

TOTAL/TOTAAL: 150



Lyne