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Basic Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE/
NATIONALE
SENIOR SERTIFIKAAT**

GRADE/GRAAD 10

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

NOVEMBER 2016

MEMORANDUM

MARKS/PUNTE: 150

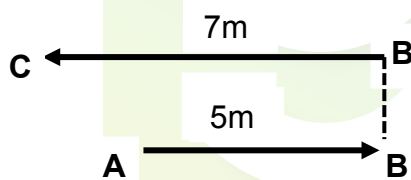
**This memorandum consists of 13 pages.
*Hierdie memorandum bestaan uit 13 bladsye.***

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

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

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

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

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 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.

(1)

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

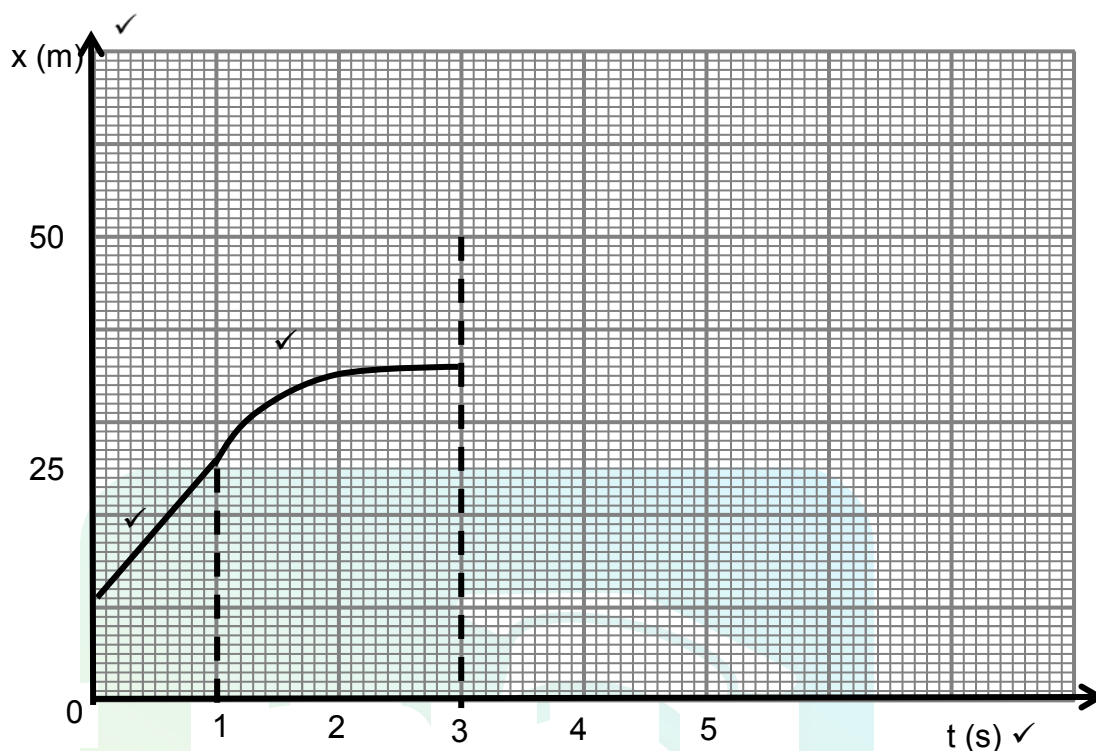
(4)

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/totale afstand $= 25 + 25 \checkmark$ $= 50 \text{ m} \checkmark$</p> <p>$\therefore$ taxi will not stop at the traffic light as distance $> 40 \text{ m} \checkmark$ \therefore die taxi sal nie by verkeerslig stop nie, want die afstand is $> 40 \text{ m}$</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;"> <p>Only one mark for either equation</p> <p><i>Slegs een punt vir die enige een van die vergelykings.</i></p> </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/totale afstand $= 25 + 25$ $= 50 \text{ m} \checkmark$</p> <p>$\therefore$ taxi will not stop at the traffic light as distance $> 40 \text{ m} \checkmark$ \therefore die taxi sal nie by verkeerslig stop nie, want die afstand is $> 40 \text{ m}$</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/totale afstand $= 25 + 25$ $= 50 \text{ m} \checkmark$</p> <p>$\therefore$ taxi will not stop at the traffic light, as distance $> 40 \text{ m} \checkmark$ \therefore die taxi sal nie betyds stop nie, want die afstand is $> 40 \text{ m}$</p> <div style="border: 1px solid black; padding: 5px; margin: 5px;"> <p>Only one mark for either equation</p> <p><i>Slegs een punt vir enige een van die vergelykings.</i></p> </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 speed 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 speed*

(2)

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

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

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 $14 \text{ (m} \cdot \text{s}^{-1}) \times \frac{3\,600}{1\,000}$ ✓
 $= 50,4 \text{ km} \cdot \text{h}^{-1}$ ✓
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
$$\left. \begin{aligned} (E_p + E_k)_{\text{top/bo}} &= (E_p + E_k)_{\text{bottom/onder}} \\ mgh + 0 &= mgh + \frac{1}{2}mv^2 \end{aligned} \right\} \text{ ✓}$$

 $(0,01)(9,8)(10) \text{ ✓} = \frac{(0,01)(9,8)(5)}{v} + \frac{1}{2} \times 0,01 \times v^2 \text{ ✓}$
 $v = 9,89 \text{ m} \cdot \text{s}^{-1} \text{ ✓}$ (4)
- 5.5 Equal to ✓. Mechanical energy is conserved ✓, it is a closed system. ✓
Gelyk aan. Meganiiese 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

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

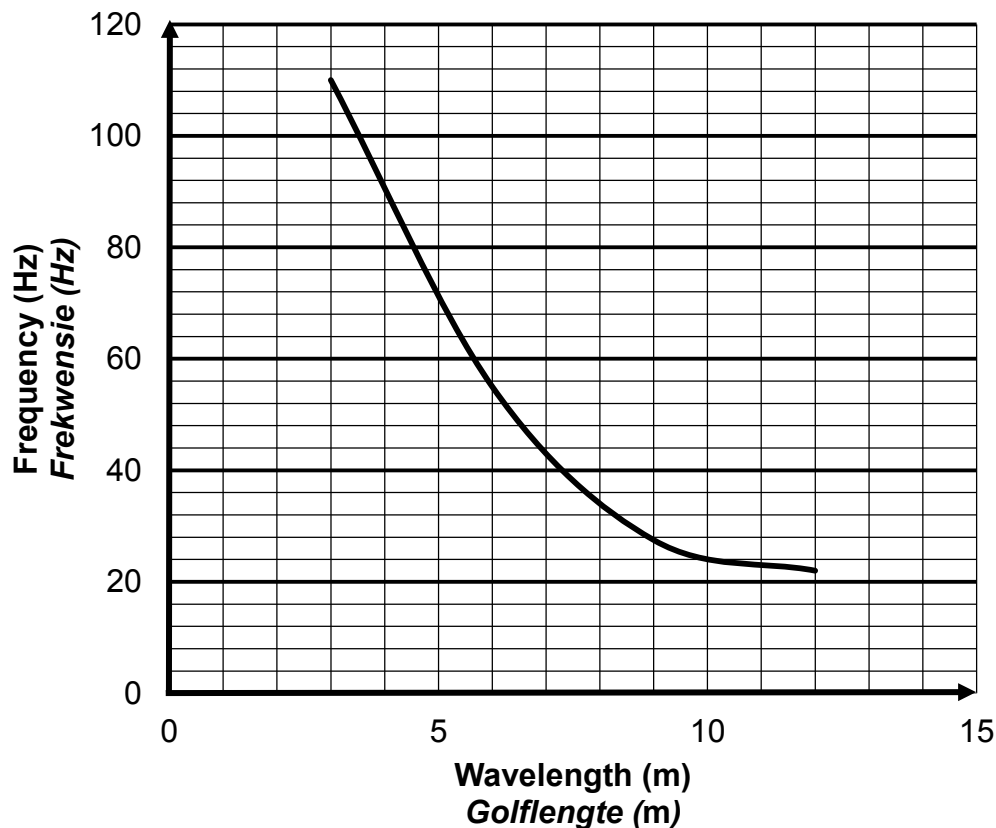
(2)
[12]

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

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*
- *RADARspoedlokalstelsels*
- *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 $E = h \frac{c}{\lambda}$ ✓

$$= 6,63 \times 10^{-34} \text{ J} \cdot \text{s} \times \frac{3 \times 10^8 \text{ m/s}}{3} \text{ ✓}$$

$$= 6,63 \times 10^{-26} \text{ J} \text{ ✓}$$

(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 $Q_{\text{new/nuut}} = \frac{Q_1 + Q_2}{2}$ ✓
 $= \frac{(+3 \times 10^{-6} + (-2 \times 10^{-6}))}{2}$ ✓
 $= 5 \times 10^{-7} \text{ C}$ ✓ (3)

10.4

OPTION 1/OPSIE 1	OPTION 2/OPSIE 2
$n = \frac{Q}{e}$ ✓ $= \frac{5 \times 10^{-7} - (-2 \times 10^{-6})}{-1,6 \times 10^{-19}}$ ✓ $= 1,56 \times 10^{13} \text{ electrons}$ ✓ <i>elektrone</i>	$n = \frac{Q}{e}$ ✓ $= \frac{5 \times 10^{-7} - (+3 \times 10^{-6})}{-1,6 \times 10^{-19}}$ ✓ $= 1,56 \times 10^{13} \text{ electrons}$ ✓ <i>elektrone</i>

(3)
[8]

QUESTION 11/VRAAG 11

11.1.1

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

(4)

11.1.2

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

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

$$\therefore V_2 = 8 \text{ V}$$

(3)

(3)

(3)

(1)

(3)
[17]

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