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)

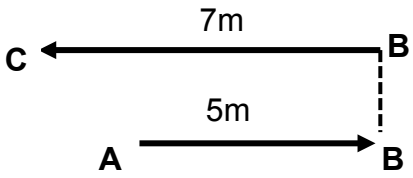
1.9 D ✓✓ (2)

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 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 $v = \frac{\Delta x}{\Delta t}$ ✓

$= \frac{2}{20}$ ✓

$= 0,1\ m \cdot s^{-1}$ ✓ west/to the left✓
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 <u>acceleration is in opposite direction</u>✓ to movement.
Die taxi beweeg stadiger, dus is <u>versnelling in die teenoorgestelde rigting</u> van beweging. (1)

3.4

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

(4)

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

OPTION 1/*OPSIE 1*

$\Delta x = \left(\frac{v_f + v_i}{2}\right) \Delta t$ ✓

$= \frac{(0+25)}{2}$ x 2✓

= 25 m

∴ total distance/*totale afstand*
= 25 + 25✓
= 50 m✓

∴taxi will not stop at the traffic light as distance > 40 m✓
∴ die taxi sal nie by verkeerslig stop nie, want die afstand is > 40 m

OPTION 2/*OPSIE 2*

$v_f = v_i + a\Delta t$✓

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

$a = \frac{(0 - 25)}{2}$ ✓

$= -12,5\ m \cdot s^{-2}$

Only one mark for either equation

Slegs een punt vir die enige een van die vergelykings.

$v_f^2 = v_i^2 + 2a\Delta x$
$0 = 25^2 + 2 \times -12,5 \times \Delta x$✓
∴Δx = 25m

∴ total distance/*totale afstand*
= 25 + 25
= 50 m✓

∴taxi will not stop at the traffic light as distance > 40 m✓
∴ die taxi sal nie by verkeerslig stop nie, want die afstand is > 40 m

OPTION 3/*OPSIE 3*

$a = \frac{v_f - v_i}{\Delta t}$✓
$= \frac{(0 - 25)}{2}$ ✓
$= -12,5\ m \cdot s^{-2}$

Only one mark for either equation

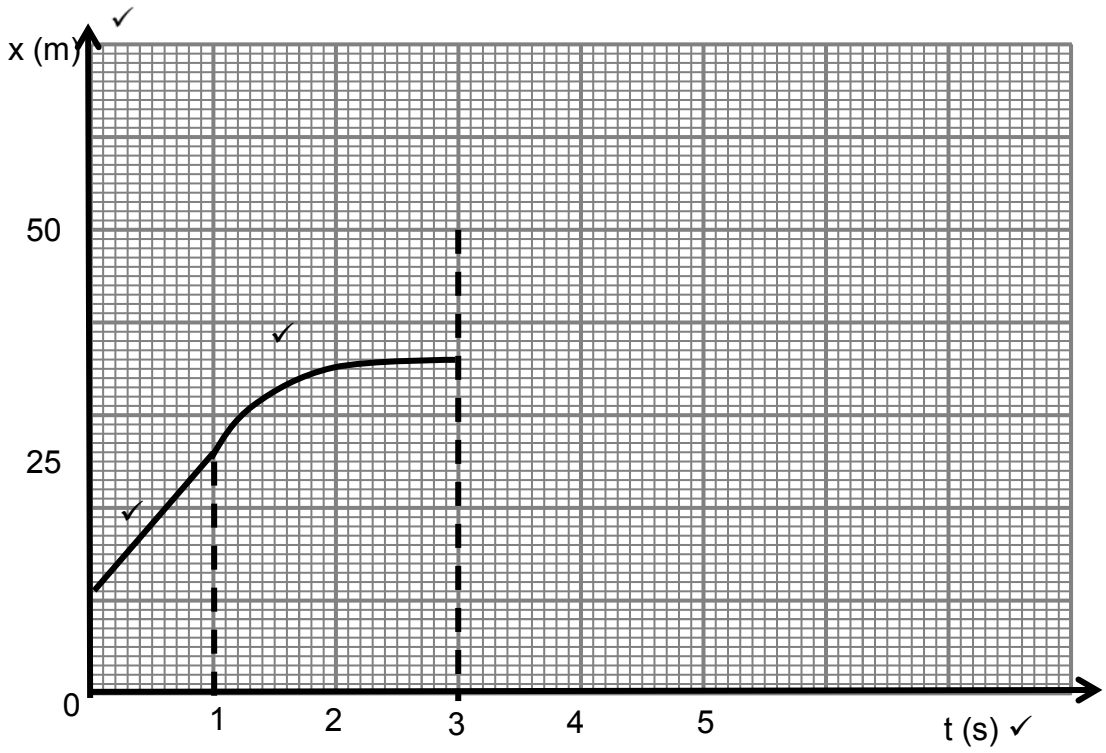
Slegs een punt vir enige een van die vergelykings.

$\Delta x = v_i t + \frac{1}{2} a \Delta t^2$
$= 25 \times 2 + \frac{1}{2} \times -12,5 \times 2^2$ ✓
= 25 m

∴ total distance/*totale afstand*
= 25 + 25
= 50 m✓

∴taxi will not stop at the traffic light, as distance > 40 m✓
∴ die taxi sal nie betyds stop nie, want die afstand is > 40 m (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 m·s^{-1} ✓north ✓ (accept range from 4,5 to 4,9)
5 m·s^{-1} noord (aanvaar vanaf 4,5 tot 4,9) (2)

4.2 8,4 m·s^{-1} ✓✓ (accept range from 8,2 to 8,6)
8,4 m·s^{-1}*(aanvaar vanaf 8,2 tot 8.6)* (2)

4.3.1
- The velocity is uniformly increasing.
- Velocity increases from 5 m·s^{-1} to 10 m·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* m·s^{-1} *tot 10* m·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)

4.4.1

OPTION 1/*OPSIE 1*	**OPTION 2/*OPSIE 2***
Distance A to C *Afstand A tot C* = ℓ x b + ½ x b x h✓ = 5 x 350 ✓+ ½ x 150 x 5✓ = 2 125 m ✓	Distance A to C *Afstand A tot C* = ℓ x b + ℓ x b + ½ x b x h✓ = 200 x 5 + 150 x 5✓+½ x 150 x 5✓ = 2 125 m ✓

OPTION 3/*OPSIE 3*
Distance A to C *Afstand A tot C* = ℓ x b + ½ (sum of parallel sides)h✓ = ℓ x b + ½ (som van parallele sye)h✓ = 5 x 200 ✓+ ½ (5 + 10)(150) ✓ = 2 125 m ✓

(4)

4.4.2

$$a = \frac{v_f - v_i}{\Delta t} \checkmark$$
$$= \frac{(0 - 10) \checkmark}{50 \checkmark}$$
$$= -0{,}2 \text{ m·s}^{-2}$$
$$\therefore a = 0{,}2 \text{ m·s}^{-2} \text{ South} \checkmark$$
Suid (4)

4.5 D to E. ✓✓
D tot E (2)

4.6 The change in speed from D to E is (-)10 $m \cdot s^{-1}$ ✓ and that occurs over (50 s) a shorter period. ✓
OR
From B to C, the change in speed is 5 $m \cdot s^{-1}$ over a period of 150 s.✓✓
OR
Gradient is the steepest
Die verandering is spoed van D tot E is (-)10 $m \cdot s^{-1}$ ✓*en die beweging gebeur oor 'n korter tydperk.*✓
OF
Vanaf B tot C is die verandering in spoed 5 $m \cdot s^{-1}$ *oor 'n tydperk van 150* s.
OF
Gradient is die steilste (2)
[20]

QUESTION 5/*VRAAG 5*

5.1 14 $(m \cdot s^{-1}) x \frac{3\,600}{1\,000}$ ✓

= 50,4 $km \cdot h^{-1}$✓

OR/*OF*

14 $(m \cdot s^{-1})$ x 3,6 ✓
= 50,4 $km \cdot h^{-1}$ ✓ (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 x 9,8 x 5✓
= 0,49 J✓ (3)

5.4 $(E_p + E_k)_{top/bo} = (E_p + E_k)_{bottom/onder}$
$mgh + 0 = mgh + ½mv^2$ ✓
$(0,01)(9,8)(10)$ ✓ $= \underline{(0,01)(9,8)(5) + ½ \times 0,01 \times v^2}$ ✓
$v = 9,89\ m \cdot s^{-1}$ ✓ (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 2½✓✓ (2)

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

6.6 2½ x 0,8✓
= 2 m✓

OR/*OF*

$v = \frac{d}{t}$

$0,4 = \frac{d}{5}$ ✓

= 2 m ✓ (2)

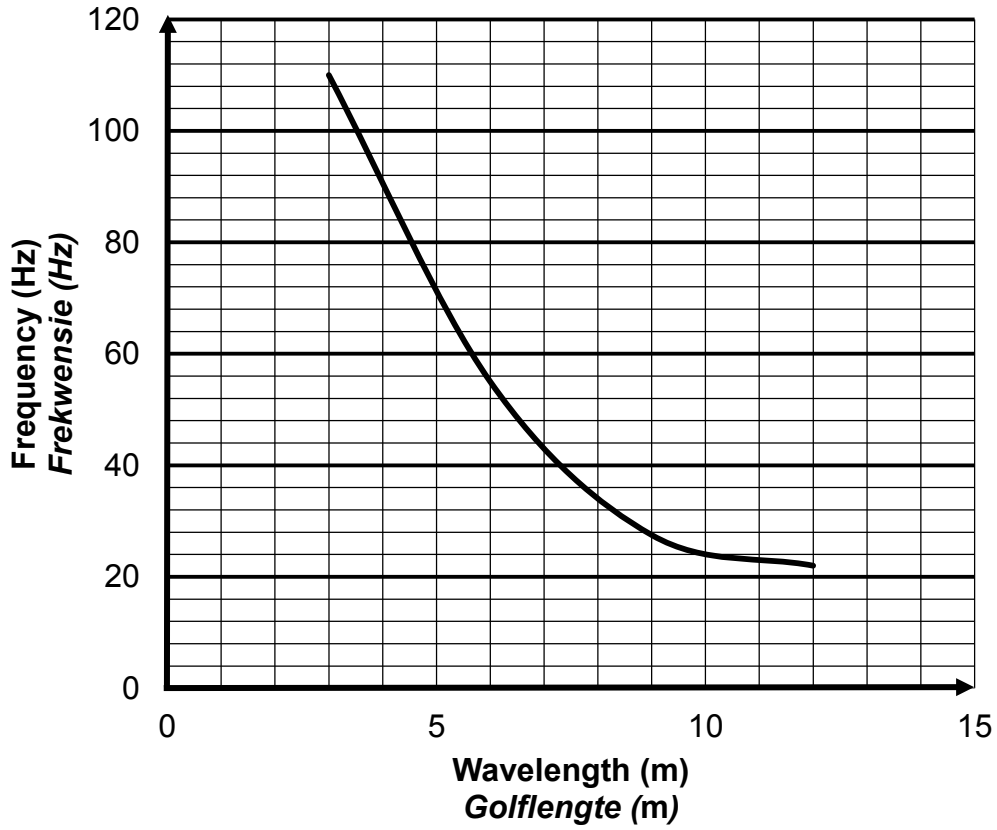
[12]

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:	***PUNTETOEKENNING:***
✓ 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	*✓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 <u>inversely proportional</u> ✓to each other.
Frekwensie en golflengte is <u>omgekeerd eweredig</u> aan mekaar. (1)

7.5 $v = f \times \lambda$ ✓
$= 55 \times 6$ ✓
$= 330\ m \cdot s^{-1}$ ✓ (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

Any ONE ✓/*Enige een*

X-strale kan:
- *weefsel beskadig*
- *kanker veroorsaak* (1)

8.4 $E = h\frac{c}{\lambda}$ ✓

$= 6{,}63 \times 10^{-34}$ ✓ $\times \frac{3 \times 10^{8}}{3}$ ✓

$= 6{,}63 \times 10^{-26}$ J ✓ (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 $Q_{new/nuut} = \frac{Q_1 + Q_2}{2}$ ✓

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

$= 5 \times 10^{-7}C$ ✓ (3)

10.4

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

(3)
[8]

QUESTION 11/*VRAAG 11*

11.1.1

OPTION 1/*OPSIE 1*	OPTION 2/*OPSIE 2*

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

(4)

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

$4 = \frac{V_2}{2}$ ✓

$\therefore V_2 = 8$ V ✓ (3)

11.1.3

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

(3)

11.1.4 A_1= 2 A
∴Q = I Δt ✓
= 2 x 120 ✓
= 240 C ✓ (3)

11.2 Decrease ✓
Afneem (1)

11.3
- If the 6 Ω resistor is removed, the <u>resistance of the whole circuit increases</u> ✓
- Since $R \alpha \frac{1}{I}$, if R increases, and <u>V is constant</u> ✓ and <u>I of the circuit</u> decreases✓

- *Indien die 6 Ω-resistor verwyder word, <u>sal die totale weerstand van die stroombaan verhoog</u>.*
- *$R \alpha \frac{1}{I}$, so indien R verhoog en V bly konstant, sal die stroom (I) verlaag.*

(3)
[17]

TOTAL/TOTAAL: 150