



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)**

EXEMPLAR/MODEL 2012

MEMORANDUM

MARKS/PUNTE: 150

**This memorandum consists of 11 pages.
*Hierdie memorandum bestaan uit 11 bladsye.***

QUESTION 1/VRAAG 1

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

QUESTION 2/VRAAG 2

- 2.1 A single force ✓
having the same effect as all other forces acting together. ✓
- 'n Enkele krag* ✓
wat dieselfde effek het as al die ander kragte tesame. ✓ (2)
- 2.2 **Upward positive/Opwaarts positief:**
$$F_{\text{net}} = F + w + f$$
$$= 1\,550 + (-1\,480) + (-20) \checkmark$$
$$= 1\,550 - 1\,500$$
$$= 50$$
$$\therefore F_{\text{net}} = 50 \text{ N } \checkmark \text{ upwards/opwaarts } \checkmark$$

Upward negative/Opwaarts negatief:
$$F_{\text{net}} = F + w + f$$
$$= -1\,550 + (1480 + 20) \checkmark$$
$$= -1\,550 + 1\,500$$
$$= -50$$
$$\therefore F_{\text{net}} = 50 \text{ N } \checkmark \text{ upwards/opwaarts } \checkmark$$
- Notes/Aantekeninge:**
The force of 1 550 N must have an opposite sign than the other two forces.

Die krag van 1 550 N moet 'n teken hê wat die teenoorgestelde is van die ander twee kragte.
- (3)
- 2.3
2.3.1 Distance/*Afstand* = 80 + 60 (1)
= 140 m ✓

2.3.2 **Upward positive/Opwaarts positief:**

Displacement / Verplasing
= +80 + (-60)
= 20 m ✓ upwards/opwaarts ✓

Upward negative/Opwaarts negatief:

Displacement / Verplasing
= -80 + 60
= 20 m ✓ upwards/opwaarts ✓

Notes/Aantekeninge:

The two displacements must have opposite signs.

Die twee verplasinge moet teenoorgestelde tekens hê.

(2)
[8]

QUESTION 3/VRAAG 3

3.1

3.1.1 Starts from rest/ $0 \text{ m}\cdot\text{s}^{-1}$ ✓
Velocity increases at a constant rate ✓
until he reaches $2,5 \text{ m}\cdot\text{s}^{-1}$ after 25 s. ✓
Begin uit rus/ $0 \text{ m}\cdot\text{s}^{-1}$ ✓
Snelheid vermeerder teen 'n konstante tempo ✓
totdat hy $2,5 \text{ m}\cdot\text{s}^{-1}$ bereik na 25 s. ✓

OR/OF

Starts from rest/ $0 \text{ m}\cdot\text{s}^{-1}$ ✓
Constant positive acceleration ✓
until he reaches $2,5 \text{ m}\cdot\text{s}^{-1}$ after 25 s. ✓
Begin uit rus/ $0 \text{ m}\cdot\text{s}^{-1}$ ✓
Konstante positiewe versnelling ✓
totdat hy $2,5 \text{ m}\cdot\text{s}^{-1}$ bereik na 25 s. ✓

(3)

3.1.2 Constant/uniform velocity ✓
for another 25 s. ✓
Konstante/uniforme snelheid ✓
vir 'n verdere 25 s. ✓

OR/OF

Velocity remains $2,5 \text{ m}\cdot\text{s}^{-1}$ in the direction of motion ✓
for another 25 s. ✓
Snelheid bly $2,5 \text{ m}\cdot\text{s}^{-1}$ in die rigting van beweging ✓
vir 'n verdere 25 s. ✓

OR/OF

Zero/No acceleration ✓
for another 25 s. ✓
Nul/Geen versnelling ✓
vir 'n verdere 25 s. ✓

(2)

3.2 Acceleration/Versnelling = $\frac{\Delta v}{\Delta t}$
= $\frac{0 - 2,5}{100 - 60}$ ✓
= - 0,0625
∴ a = 0,063 m·s⁻² ✓
opposite to direction of motion/teenoorgesteld aan bewegingsrigting ✓ (4)

3.3 Length of track = Area between the graph and the time axis ✓
Lengte van baan = Area tussen grafiek en tydas
= $\frac{1}{2}(2,5) \times (35 + 100)$ ✓
= 168,75 m ✓

OR/OF

Length of track/Lengte van baan = Area of trapezium/Area van trapesium
= $\frac{1}{2}(2,5) \times (35 + 100)$ ✓
= 168,75 m ✓

OR/OF

Length of track/Lengte van baan = $\frac{1}{2}h(\text{sum of // sides})/\frac{1}{2}h(\text{som van // sye})$
= $\frac{1}{2}(2,5) \times (35 + 100)$ ✓
= 168,75 m ✓

OR/OF

Length of track = Area between the graph and the time axis ✓
Lengte van baan = Area tussen grafiek en tydas
= $\frac{1}{2}bh + \frac{1}{2}bh + lb$
= $\frac{1}{2}(25)(2,5) + \frac{1}{2}(40)(2,5)$ ✓ + (35)(2,5) ✓
= 31,25 + 87,5 + 50
= 168,75 m ✓

OR/OF

Length of track = Area of triangle + area of triangle + area of rectangle
Lengte van baan = Area van driehoek + area van driehoek + area v. reghoek
= $\frac{1}{2}bh + \frac{1}{2}bh + lb$
= $\frac{1}{2}(25)(2,5) + \frac{1}{2}(40)(2,5)$ ✓ + (35)(2,5) ✓
= 31,25 + 87,5 + 50
= 168,75 m ✓

OR/OF

Length of track/Lengte van baan = $\frac{1}{2}bh + \frac{1}{2}bh + lb$
= $\frac{1}{2}(25)(2,5) + \frac{1}{2}(40)(2,5)$ ✓ + (35)(2,5) ✓
= 31,25 + 87,5 + 50
= 168,75 m ✓

(4)
[13]

QUESTION 4/VRAAG 4

4.1 To compensate for friction. ✓✓
Om vir wrywing te vergoed. ✓✓

OR/OF

To ensure that the trolley moves at constant acceleration. ✓✓
Om te verseker dat die trollie teen konstante versnelling beweeg. ✓✓ (2)

4.2

4.2.1 Time/Tyd ✓

(1)

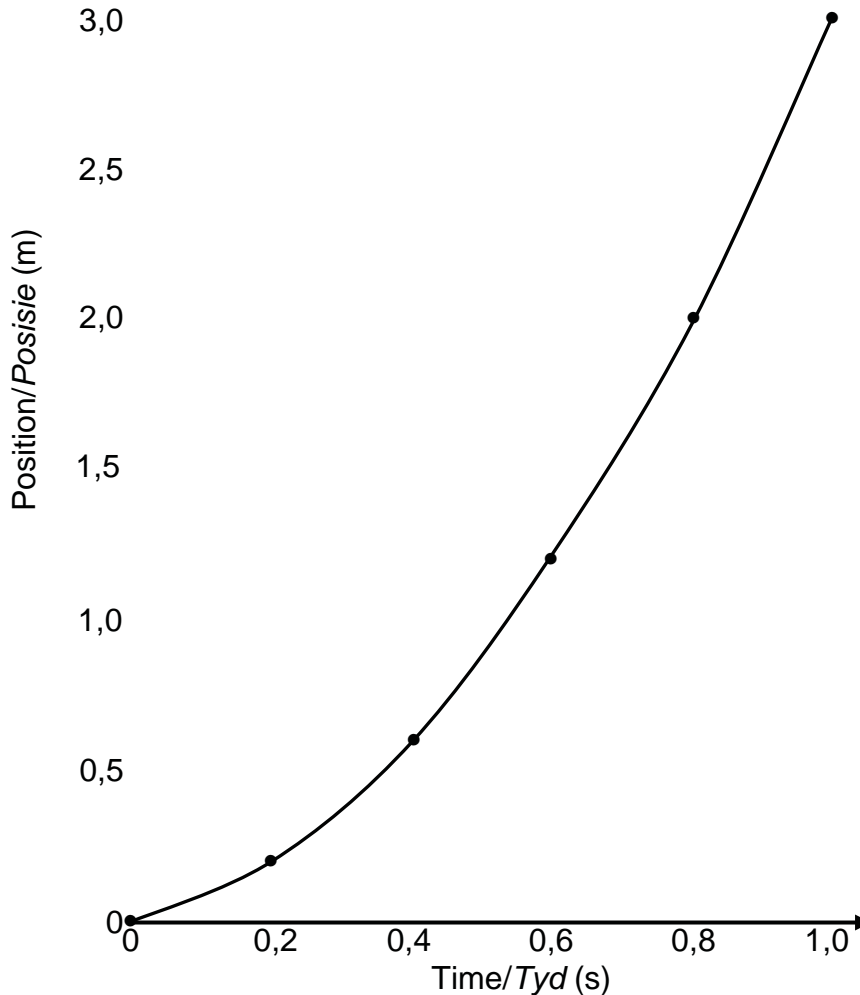
4.2.2 Displaceme

(1)

4.3

Graph

1000 tyd



Criteria for graph:

- Suitable heading. ✓
- Correct labels on both axes. ✓
- Appropriate scale on both axes. ✓
- Any three points plotted correctly. ✓
- All six points plotted correctly. ✓
- Curve joining the points. ✓

Kriteria vir grafiek:

- Geskikte opskrif. ✓
- Korrekte benoemings op beide asse. ✓
- Geskikte skaal op beide asse. ✓
- Enige drie punte korrek gestip. ✓
- Al ses punte korrek gestip. ✓
- Kromme wat die punte verbind. ✓

(6)

4.4

Uniformly accelerated motion. ✓

The gradient of the graph increases constantly. ✓

Uniform versnelde beweging. ✓

Die gradiënt van die grafiek vermeerder konstant. ✓

OR/OF

Uniformly accelerated motion. ✓

The velocity increases constantly each 0,2 s. ✓

Uniform versnelde beweging. ✓

Die snelheid vermeerder konstant elke 0,2 s. ✓

(2)

[12]

QUESTION 5/VRAAG 5

5.1

5.1.1 Acceleration/*Versnelling* ✓ (1)

5.1.2 Straight line/*Reguitlyn* ✓ (1)

5.2 $15 \text{ m}\cdot\text{s}^{-1} = (15)\left(\frac{3600}{1000}\right) \checkmark \text{ km}\cdot\text{h}^{-1} = 54 \text{ km}\cdot\text{h}^{-1} \checkmark < 60 \text{ km}\cdot\text{h}^{-1}$

No ✓/He did not.
Nee ✓/Hy het nie.

OR/OF

$60 \text{ km}\cdot\text{h}^{-1} = (60)\left(\frac{1000}{3600}\right) \checkmark \text{ m}\cdot\text{s}^{-1} = 16,67 \text{ m}\cdot\text{s}^{-1} \checkmark > 15 \text{ m}\cdot\text{s}^{-1}$

No ✓/He did not.
Nee ✓/Hy het nie.

(3)

5.3

<p><u>OPTION 1/OPSIE 1</u> $\Delta x = v_i \Delta t \checkmark$ $= (15)(1) \checkmark$ $= 15 \text{ m} \checkmark$</p>	<p><u>Notes/Aantekeninge:</u> Accept/Aanvaar: $s = vt$ $s = ut + \frac{1}{2}at^2$ $s = \left(\frac{u+v}{2}\right)t$</p>
<p><u>OPTION 2/OPSIE 2</u> $\Delta x = v_i \Delta t + \frac{1}{2}a\Delta t^2 \checkmark$ $= (15)(1) + \frac{1}{2}(0)(1)^2 \checkmark$ $= 15 \text{ m} \checkmark$</p>	
<p><u>OPTION 3/OPSIE 3</u> $\Delta x = \left(\frac{v_f + v_i}{2}\right)\Delta t \checkmark$ $= \left(\frac{15+15}{2}\right)(1) \checkmark$ $= 15 \text{ m}$</p>	

(3)

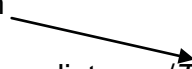
5.4 **POSITIVE MARKING FROM QUESTION 5.3**
POSITIEWE NASIEN VAN VRAAG 5.3

Braking distance/*Remafstand*:

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

$$= \left(\frac{0 + 15}{2}\right) \checkmark (3) \checkmark$$

$$= 22,5 \text{ m}$$



Total stopping distance/*Totale stilhouafstand* = $22,5 + 15 \text{ m} \checkmark$
 $= 37,5 \text{ m} \checkmark$

Yes ✓/He will stop before the pedestrian crossing.
Ja/Hy sal voor die voetorgang tot stilstand kom.

(6)

- 5.5 Increases ✓
For the same change in velocity, ✓
the stopping time will increase. ✓

*Toeneem ✓
Vir dieselfde verandering in snelheid, ✓
verhoog die stilhoutyd. ✓*

(3)
[17]

QUESTION 6/VRAAG 6

- 6.1 The total mechanical energy remains constant/is conserved ✓
in a closed/isolated system. ✓
Die totale meganiese energie bly konstant/bly behoue ✓
in 'n geslote/geïsoleerde sisteem. ✓

(2)

- 6.2 $E_p = mgh$ ✓
 $= (0,2)(9,8)(0,8)$ ✓
 $= 1,568 \text{ J}$ ✓

(3)

- 6.3 $E_M(B) = E_M(A)$ ✓ / $(E_p + E_k)_B = (E_p + E_k)_A$ / $mgh_B + \frac{1}{2}mv_B^2 = mgh_A + \frac{1}{2}mv_A^2$
 $(0,2)(9,8)h$ ✓ + $\frac{1}{2}(0,2)(3)^2$ ✓ = $(0,2)(9,8)(0,8)$ ✓ + $\frac{1}{2}(0,2)(0)^2$ ✓
 $\therefore h = 0,34 \text{ m}$ ✓

(6)

6.4

- 6.4.1 Mechanical/kinetic energy converted to heat/sound/internal energy. ✓
Meganiese/kinetiese energie omgeskakel na hitte-/klank-/interne energie. ✓

(1)

- 6.4.2 $v_f^2 = v_i^2 + 2a\Delta x$ ✓
 $(0)^2$ ✓ = $(3,96)^2 + 2a(2)$ ✓
 $a = -3,92 \text{ m}\cdot\text{s}^{-2}$
 $\therefore a = 3,92 \text{ m}\cdot\text{s}^{-2}$ ✓

opposite to the direction of motion ✓
teenoorgestel aan bewegingsrigting ✓

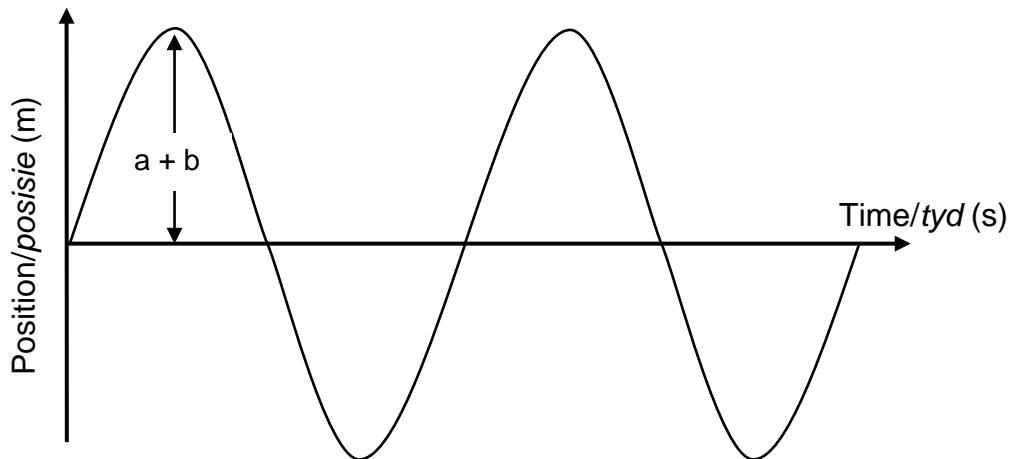
(5)
[17]

QUESTION 7/VRAAG 7

7.1

7.1.1 The maximum displacement of a particle ✓
 from its equilibrium position/position of rest. ✓
 Die maksimum verplasing van 'n deeltjie ✓
 van sy ewewigsposisie/posisie van rus. ✓ (2)

7.1.2



<p>Criteria for diagram: Diagram shows two complete waves. ✓ Amplitude correctly shown. ✓ Correct shape. ✓</p>	<p>Kriteria vir diagram: Diagram toon twee volledige golwe. ✓ Amplitude korrek getoon. ✓ Korrekte vorm. ✓</p>
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(3)

7.1.3 (Constructive) interference ✓
 (Konstruktiewe) interferensie ✓ (1)

7.1.4 Principle of superposition ✓
 Beginsel van superposisie ✓ (1)

7.2

7.2.1 The distance between two consecutive points in phase. ✓✓
 Die afstand tussen twee opeenvolgende punte in fase. ✓✓

OR/OF

The distance between two consecutive crests/troughs. ✓✓
 Die afstand tussen twee opeenvolgende kruine/buike. ✓✓ (2)

7.2.2 Upward/Opwaarts ✓✓ (2)

7.2.3 $f = \frac{1}{T}$ ✓
 $= \frac{1}{5}$ ✓
 $= 0,2 \text{ Hz}$ ✓ (3)

7.2.4 **POSITIVE MARKING FROM QUESTION 7.2.3**
POSITIEWE NASIEN VAN VRAAG 7.2.3

<u>OPTION 1/OPSIE 1</u>	<u>OPTION 2/OPSIE 2</u>
$v = f\lambda$ ✓ $= 0,2 \times 1,5$ ✓ $= 0,3 \text{ ms}^{-1}$ ✓	$\Delta x = v\Delta t$ ✓ $1,5 = v(5)$ ✓ $\therefore v = 0,3 \text{ ms}^{-1}$ ✓

(3)
[18]

QUESTION 8/VRAAG 8

8.1

8.1.1 Compression/*Verdigting* ✓ (1)

8.1.2 Wavelength/*Golflengte* ✓ (1)

8.2

8.2.1 Longitudinal wave/*Longitudinale golf* ✓ (1)

8.2.2 Y ✓ (1)

8.2.3 Higher amplitude/*Hoër amplitude* ✓ (1)

8.2.4 Shorter wavelength/*Korter golflengte* ✓

OR/OF

Points X, Y and Z closer together.

Punte X, Y en Z sal nader aan mekaar wees.

(1)
[6]

QUESTION 9/VRAAG 9

9.1 Accelerating charges/*Versnelde ladings* ✓ (1)

9.2

9.2.1 Infrared/*Infrarooi* ✓ (1)

9.2.2 Ultraviolet/*Ultraviolet* ✓ (1)

9.2.3 γ rays/ *γ -strale* ✓ (1)

9.2.4 γ rays/ *γ -strale* ✓ (1)

9.3 High energy/frequency/penetrating ability. ✓

Damage living cells/Cause cancer/Cause mutations ✓

Hoë energie/frekwensie/deurdringingsvermoë. ✓

Beskadig lewende selle./Veroorsaak kanker./Veroorsaak mutasies. ✓

(2)

9.4

$$E = \frac{hc}{\lambda} \checkmark$$

$$= \frac{6,63 \times 10^{-34} \times 3 \times 10^8}{2,1 \times 10^{-9}} \checkmark$$

$$= 9,47 \times 10^{-17} \text{ J} \checkmark$$

(4)
[11]

QUESTION 10/VRAAG 10

10.1

10.1.1 Region in space where another magnet/ferromagnetic material will experience a magnetic force. ✓✓

Gebied in die ruimte waar 'n ander magneet/ferromagnetiese materiaal 'n magnetiese krag sal ondervind. ✓✓

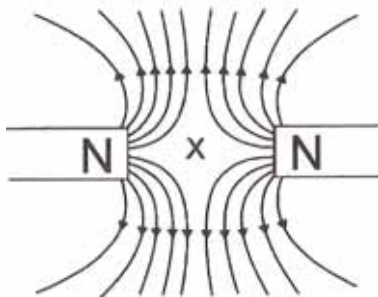
(2)

10.1.2 S pole/S-pool ✓

(1)

10.2

10.2.1



Criteria for magnetic field pattern

- Correct shape. ✓
- Correct direction. ✓
- Field lines do not touch/cross each other. ✓

Kriteria vir magneetveldpatroon

- Korrekte vorm. ✓
- Korrekte rigting. ✓
- Veldlyne raak/kruis nie mekaar nie. ✓

(3)

10.2.2 Fewer magnetic field lines further apart./less dense. ✓

Minder magneetveldlyne verder uitmekaar/minder dig. ✓

(1)

[7]

QUESTION 11/VRAAG 11

11.1 During contact, electrons are transferred from A to B. ✓

The spheres acquire equal charges. ✓

Spheres thus repel each other. ✓

Tydens kontak word elektrone van A na B oorgedra. ✓

Die sfere verkry gelyke ladings.

Sfere stoot mekaar dus af.

(3)

11.2

$$Q = \frac{4,5 \times 10^{-9} + (-2,8 \times 10^{-9})}{2} = + 8,5 \times 10^{-10} \text{ C} \checkmark$$

(3)

$$\begin{aligned} 11.3 \quad \Delta Q_A &= Q_A(\text{final}/\text{finaal}) - Q_A(\text{initial}/\text{aanvanklik}) \\ &= 8,5 \times 10^{-10} - (-2,8 \times 10^{-9}) \checkmark \\ &= 3,65 \times 10^{-9} \text{ C } \checkmark \end{aligned}$$

OR/OF

$$\begin{aligned} \Delta Q_B &= Q_B(\text{final}/\text{finaal}) - Q_B(\text{initial}/\text{aanvanklik}) \\ &= 8,5 \times 10^{-10} - 4,5 \times 10^{-9} \checkmark \\ &= 3,65 \times 10^{-9} \text{ C } \checkmark \end{aligned}$$

$$\begin{aligned} \text{Number of electrons/Aantal elektrone} &= \frac{3,65 \times 10^{-9}}{1,6 \times 10^{-19}} \checkmark \\ &= 2,28 \times 10^{10} \checkmark \end{aligned}$$

(4)
[10]

QUESTION 12/VRAAG 12

$$\begin{aligned} 12.1 \quad \frac{1}{R_p} &= \frac{1}{R_1} + \frac{1}{R_2} \checkmark \\ &= \frac{1}{2} + \frac{1}{2} \checkmark \\ \therefore R_p &= 1 \Omega \checkmark \end{aligned}$$

(3)

12.2

$$12.2.1 \quad 6 \text{ V } \checkmark$$

(1)

$$12.2.2 \quad 4,5 \text{ V } \checkmark \checkmark$$

(2)

12.3 **POSITIVE MARKING FROM QUESTION 12.2.2.**
POSITIEWE NASIEN VAN VRAAG 12.2.2.

$$\begin{aligned} Q &= I\Delta t \checkmark \\ &= (2)(3) \checkmark \\ &= 6 \text{ C} \end{aligned}$$

$$V = \frac{W}{q} \checkmark$$

$$4,5 = \frac{W}{6} \checkmark$$

$$\therefore W = 27 \text{ J } \checkmark$$

(5)

12.4 Increases/Vermeerder \checkmark

(1)
[12]

GRAND TOTAL/GROOTTOTAAL: 150