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*:**

$F_{net} = F + w + f$
$= 1\,550 + (-1\,480) + (-20)$ ✓
$= 1\,550 - 1\,500$
$= 50$
$\therefore F_{net} = 50$ N ✓upwards/*opwaarts* ✓

Upward negative/*Opwaarts negatief*:

$F_{net} = F + w + f$
$= -1\,550 + (1480 + 20)$ ✓
$= -1\,550 + 1\,500$
$= -50$
$\therefore F_{net} = 50$ N ✓upwards/*opwaarts* ✓ (3)

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.

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* ✓ (2)
[8]

Notes/*Aantekeninge:*
The two displacements must have opposite signs.

Die twee verplasings moet teenoorgestelde tekens hê.

QUESTION 3/*VRAAG 3*

3.1
3.1.1 Starts from rest/0 $m \cdot s^{-1}$ ✓
Velocity increases at a constant rate ✓
until he reaches 2,5 $m \cdot s^{-1}$ after 25 s. ✓
Begin uit rus/0 $m \cdot s^{-1}$ ✓
Snelheid vermeerder teen 'n konstante tempo ✓
totdat hy 2,5 $m \cdot s^{-1}$ bereik na 25 s. ✓

OR/*OF*
Starts from rest/0 $m \cdot s^{-1}$ ✓
Constant positive acceleration ✓
until he reaches 2,5 $m \cdot s^{-1}$ after 25 s. ✓
Begin uit rus/0 $m \cdot s^{-1}$ ✓
Konstante positiewe versnelling ✓
totdat hy 2,5 $m \cdot s^{-1}$ 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 $m \cdot s^{-1}$ in the direction of motion ✓
for another 25 s. ✓
Snelheid bly 2,5 $m \cdot s^{-1}$ 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/V*ersnelling* $= \frac{\Delta v}{\Delta t}$

$= \frac{0 - 2{,}5\ \checkmark}{100 - 60\ \checkmark}$

$= -0{,}0625$

$\therefore$ 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
= ½(2,5) ✓(35 + 100) ✓
= 168,75 m ✓

OR/*OF*

Length of track/*Lengte van baan* = Area of trapezium/*Area van trapesium*
= ½(2,5) ✓(35 + 100) ✓
= 168,75 m ✓

OR/*OF*

Length of track/*Lengte van baan* = ½h(sum of // sides)/*½h(som van // sye)*
= ½(2,5) ✓(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
= ½bh + ½bh + lb
= ½(25)(2,5) + ½(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
= ½bh + ½bh + lb
= ½(25)(2,5) + ½(40)(2,5) ✓ + (35)(2,5) ✓
= 31,25 + 87,5 + 50
= 168,75 m ✓

OR/*OF*

Length of track/*Lengte van baan* = ½bh + ½bh + lb
= ½(25)(2,5) + ½(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*

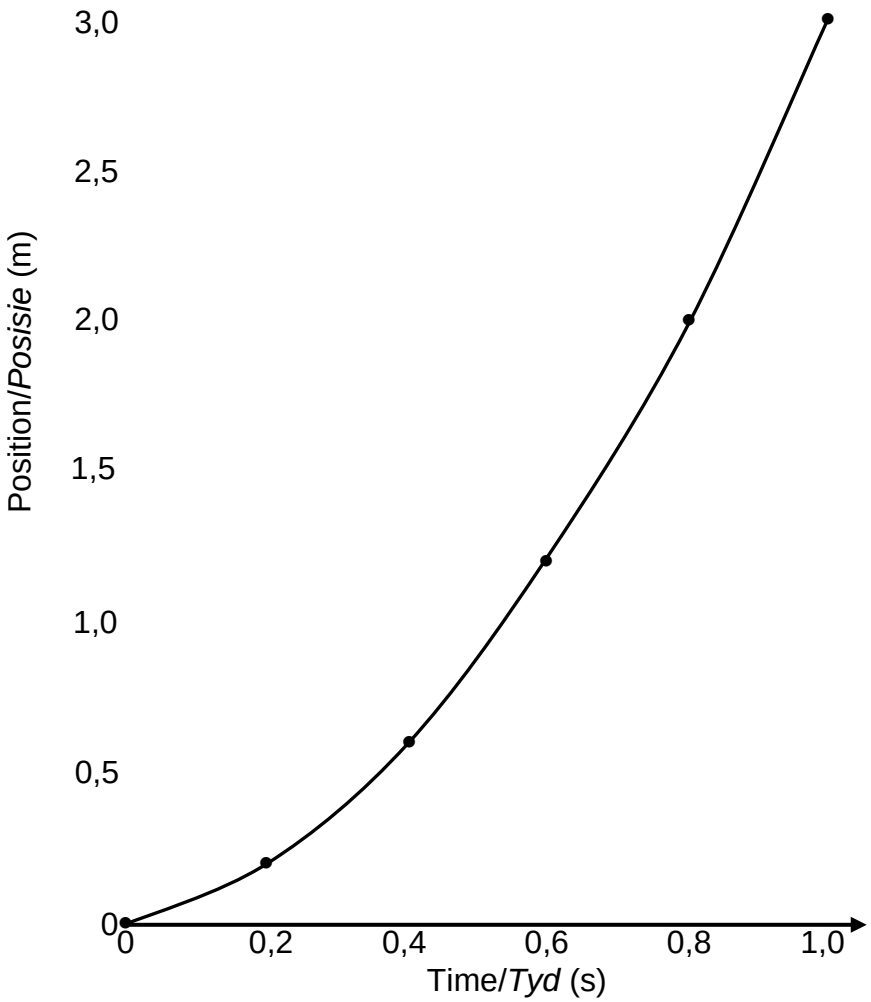
To ensure that the trolley moves at constant acceleration. ✓✓
Om te verseker dat die trollie teen konstante versnelling beweeg. ✓✓ (2)

4.2

4.2.1 Time/*Tyd* ✓ (1)

4.2.2 Displaceme (1)

4.3 **Graph** **noor tyd**



Criteria for graph:	***Kriteria vir grafiek:***
• Suitable heading. ✓	•*Geskikte opskrif.* ✓
• Correct labels on both axes. ✓	•*Korrekte benoemings op beide asse.* ✓
• Appropriate scale on both axes. ✓	•*Geskikte skaal op beide asse.* ✓
• Any three points plotted correctly. ✓	•*Enige drie punte korrek gestip.* ✓
• All six points plotted correctly. ✓	•*Al ses punte korrek gestip.* ✓
• Curve joining the points. ✓	•*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 velcoity 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 $15\ m\cdot s^{-1} = (15)(\frac{3600}{1000})$ ✓ $km\cdot h^{-1} = 54\ km\cdot h^{-1}$ ✓ $< 60\ km\cdot h^{-1}$

No ✓/He did not.
Nee ✓/Hy het nie.

OR/*OF*

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

No ✓/He did not.
Nee ✓/Hy het nie.

(3)

5.3

OPTION 1/*OPSIE 1*	**Notes/*Aantekeninge:***
$\Delta x = v_i\Delta t$ ✓ $= (15)(1)$ ✓ $= 15\ m$ ✓	Accept/*Aanvaar:* $s = vt$ $s = ut + \frac{1}{2}at^2$ $s = \left(\frac{u+v}{2}\right)t$
OPTION 2/*OPSIE 2*	
$\Delta x = v_i\Delta t + \frac{1}{2}a\Delta t^2$ ✓ $= (15)(1) + \frac{1}{2}(0)(1)^2$ ✓ $= 15\ m$ ✓	
OPTION 3/*OPSIE 3*	
$\Delta x = \left(\frac{v_f + v_1}{2}\right)\Delta t$ ✓ $= \left(\frac{15+15}{2}\right)(1)$ ✓ $= 15\ m$	

(3)

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

Braking distance/*Remafstand*:

$\Delta x = \left(\frac{v_f + v_1}{2}\right)\Delta t$ ✓

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

$= 22,5\ m$

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

Yes✓/He will stop before the pedestrian crossing.
Ja/Hy sal voor die voetoorgang 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 $E_p = mgh$ ✓
$= (0,2)(9,8)(0,8)$ ✓
$= 1,568$ J ✓ (3)

6.3 $E_M(B) = E_M(A)$ ✓ / $(E_p + E_k)_B = (E_p + E_k)_A$ / $mgh_B + ½mv_B^2 = mgh_A + ½mv_A^2$
$(0,2)(9,8)h$ ✓ + $½(0,2)(3)^2$ ✓ = $(0,2)(9,8)(0,8)$ ✓ + $½(0,2)(0)^2$ ✓
$\therefore h = 0,34$ 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)

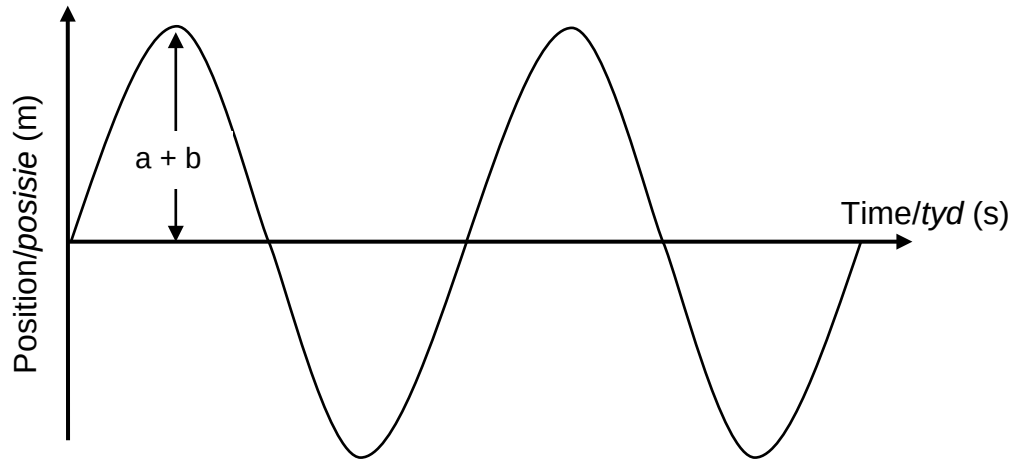
6.4.2 $v_f^2 = v_i^2 + 2a\Delta x$ ✓
$(0)^2$ ✓ = $(3,96)^2 + 2a(2)$ ✓
$a = -3,92$ m·s^{-2}
$\therefore a = 3,92$ m·s^{-2} ✓
opposite to the direction of motion ✓
teenoorgesteld aan bewegingsrigting ✓ (5)
[17]

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



Criteria for diagram:	***Kriteria vir diagram:***
Diagram shows two complete waves. ✓	*Diagram toon twee volledige golwe.* ✓
Amplitude correctly shown. ✓	*Amplitude korrek getoon.* ✓
Correct shape. ✓	*Korrekte vorm.* ✓

(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

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

(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 $E = \frac{hc}{\lambda}$ ✓

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

$= 9,47 \times 10^{-17} J$ ✓ (4)
[11]

QUESTION 10/*VRAAG 10*

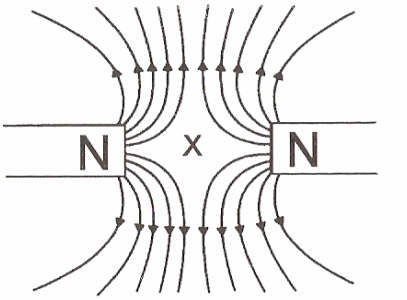
10.1

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	***Kriteria vir magneetveldpatroon***
• Correct shape. ✓	• *Korrekte vorm.* ✓
• Correct direction. ✓	• *Korrekte rigting.* ✓
• Filed lines do not touch/cross each other. ✓	• *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 $Q = \frac{4{,}5\times10^{-9} + (-2{,}8\times10^{-9})}{2}$ ✓ ✓ $= +\ 8{,}5 \times 10^{-10}$ C ✓ (3)

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

OR/*OF*
$\Delta Q_B = Q_B(\text{final/}finaal) - Q_B(\text{initial/}aanvanklik)$
$= 8,5 \times 10^{-10} - 4,5 \times 10^{-9}$ ✓
$= 3,65 \times 10^{-9}$ C ✓

Number of electrons/*Aantal elektrone* = $\frac{3,65 \times 10^{-9}}{1,6 \times 10^{-19}}$ ✓
$= 2,28 \times 10^{10}$ ✓ (4)
[10]

QUESTION 12/*VRAAG 12*

12.1 $\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2}$ ✓
$= \frac{1}{2} + \frac{1}{2}$ ✓
$\therefore R_p = 1\ \Omega$ ✓ (3)

12.2
12.2.1 6 V ✓ (1)

12.2.2 4,5 V ✓✓ (2)

12.3 **POSITIVE MARKING FROM QUESTION 12.2.2.**
POSITIEWE NASIEN VAN VRAAG 12.2.2.
$Q = I\Delta t$ ✓
$= (2)(3)$ ✓
$= 6$ C
$V = \frac{W}{q}$ ✓
$4,5 = \frac{W}{6}$ ✓
$\therefore W = 27$ J ✓ (5)

12.4 Increases/*Vermeerder* ✓ (1)
[12

GRAND TOTAL/*GROOTTOTAAL*: 150