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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 2018

MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS/*PUNTE*: 150

These marking guidelines consist of 12 pages.
Hierdie nasienriglyne bestaan uit 12 bladsye.

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QUESTION 1/*VRAAG 1*

1.1 C✓✓

1.2 C✓✓

1.3 A✓✓

1.4 A✓✓

1.5 C✓✓

1.6 A✓✓

1.7 B✓✓

1.8 B✓✓

1.9 C✓✓

1.10 C/B✓✓

[20]

QUESTION 2/*VRAAG 2*

2.1 The difference in position (in space). ✓✓/*Die verskil in posisie in ruimte.*

OR/*OF*

The change in position (of an object.)✓✓/*Die verandering in posisie van 'n voorwerp.* (2)

2.2 12 m ✓west/*wes*✓ or/*of* -12 m ✓✓

IF/*INDIEN*
– 12 m West/Wes (Award 1 mark only/*Ken 1 punt toe*)

Accept/*Aanvaar*
12 m✓ left/*links* ✓ (2)

2.3 $v = \frac{\Delta x}{\Delta t}$
$= \frac{5}{30}$ ✓ ✓
= 0,17 $m \cdot s^{-1}$✓ west/*wes* ✓

Accept/*Aanvaar*
0,17 $m \cdot s^{-1}$✓ left/*links* ✓ (4)

2.4 **POSITIVE MARKING FROM 2.2 and 2.3/*POSITIEWE NASIEN VANAF 2.2.en2.3***

$\text{Speed} = \frac{\text{distance}}{\text{time}}$ / $\text{Spoed} = \frac{\text{afstand}}{\text{tyd}}$

(0,17)(2) ✓ = 0,34 $m \cdot s^{-1}$

$0{,}34$ ✓ $= \frac{12}{\Delta t}$ ✓

$\Delta t = 35{,}29$ s ✓ (4)

[12]

QUESTION 3/*VRAAG 3*

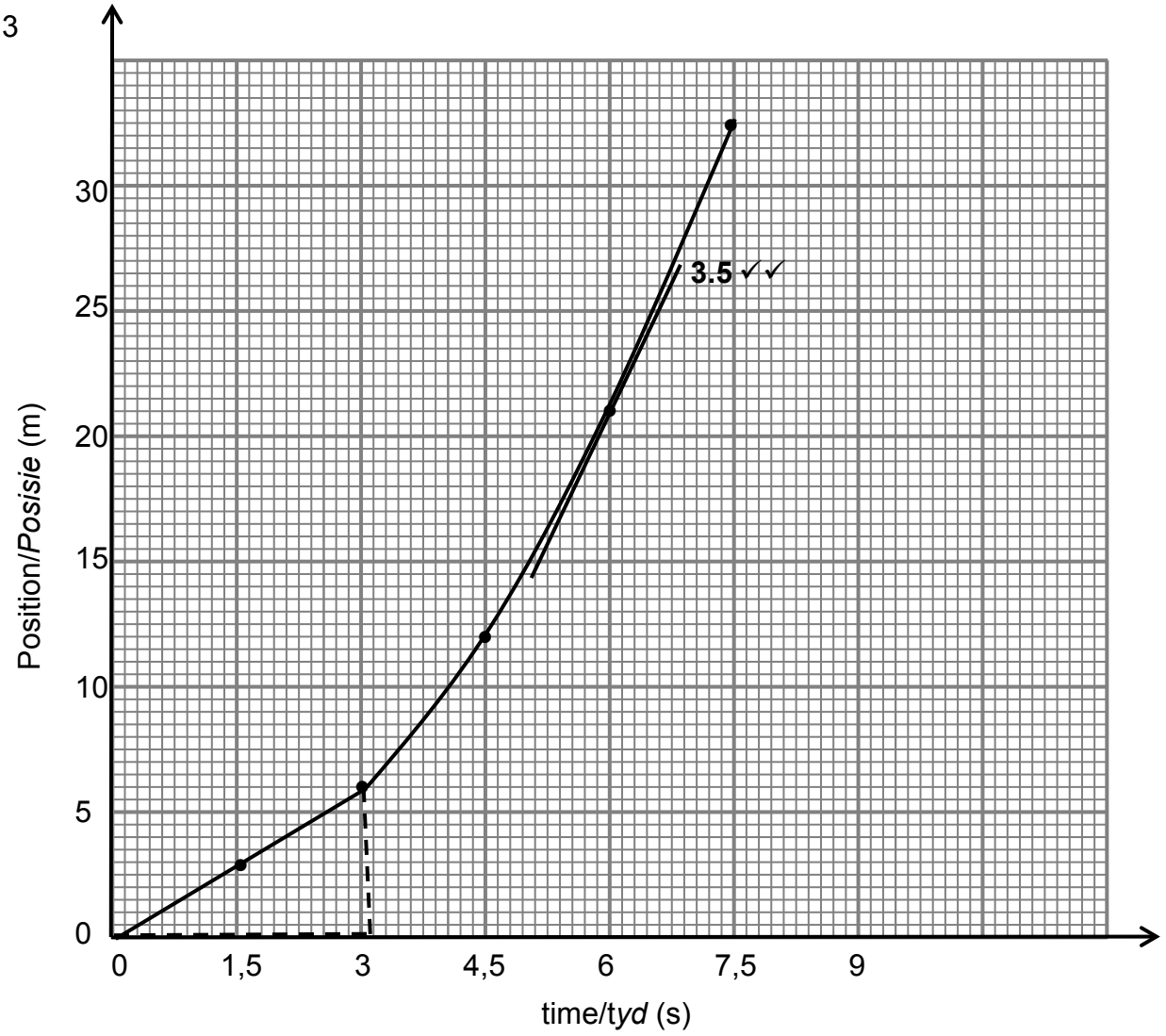
3.1 **Motion with uniform velocity:** Motion at constant velocity. ✓✓/ Motion with zero or no acceleration.
Beweging met uniforme snelheid: *Beweging teen konstante snelheid./ Beweging met nul of geen vernselling.*

Uniform accelerated motion: Motion with constant acceleration.✓✓/Velocity changes with the same amount during each time interval. ✓✓/Motion during which the velocity changes with a constant amount per unit time. ✓✓/
Uniforme versnelde beweging: *Beweging met konstante versnelling/Snelheid verander met dieselfde hoeveelheid gedurende elke tydinterval/Beweging waartydens die snelheid met 'n konstante hoeveelheid per eenheid tyd verander.* (4)

3.2.1 Motion with uniform velocity✓/*Beweging met uniforme snelheid* (1)

3.2.2 Uniform accelerated motion ✓/*Uniforme versnelde beweging* (1)

3.3



MARKING GUIDELINES/*NASIENRIGLYNE*
- ✓ x-axis and units correctly labelled/*x-as en eenhede korrek gemerk*
- ✓ y-axis and units correctly labelled/y-*as en eenhede korrek gemerk*
- ✓ 2 points correctly plotted and joined/*2 punte korrek gestip en verbind*
- ✓ shape of the graph (0 – 3 s/*vorm van die grafiek(0 – 3s)* / straight line/*reguitlyn*
- ✓ shape of graph 3 – 7,5 s curved / *vorm van grafiek 3 – 7,5 s kurwe* / tangent /*raaklyn*

(5)

3.4 Instantaneous velocity: rate of change in position. ✓✓/*Oombliklike snelheid: tempo van verandering in posisie.*

OR/*OF*
Displacement divided by a very small time interval. ✓✓/*Verplasing gedeel deur 'n baie klein tydinterval.*

OR/*OF*
Velocity at a particular time. ✓✓/*Snelheid op 'n spesifieke tyd.* (2)

3.5 Refer to the graph./*Verwys na die grafiek.*
(Tangent to the curve/ *Raaklyn aan kurwe*) (2)

3.6
$$v = \frac{\Delta x}{\Delta t}$$
$$= \frac{6-0}{3-0} \checkmark \checkmark$$
$= 2 \text{ m·s}^{-1}$✓ right/*regs* ✓ (4)
[19]

QUESTION 4/*VRAAG 4*

4.1 The rate of change of velocity. ✓✓/*Die tempo van verandering van snelheid*. (2)

4.2.1 $v_f = v_i + a\Delta t$ ✓
0✓ $= \underline{15 + (-4,5)\Delta t}$ ✓
$\Delta t = 3,33$ s ✓

OR/*OF*
$v_f = v_i + a\Delta t$ ✓
0✓ $= \underline{-15 + (4,5)\Delta t}$ ✓
$\Delta t = 3,33$ s ✓ (4)

4.2.2

<u>OPTION 1/*OPSIE 1*</u>
$v_f^2 = v_i^2 + 2a\Delta x$ ✓
0^2 ✓$= \underline{15^2 + 2(-4,5)\Delta x}$ ✓
$\Delta x = 25$ m ✓

<u>OPTION 2/*OPSIE 2*</u>
POSITIVE MARKING FROM 4.2.1/*POSITIEWE NASIEN VANAF 4.2.1*
$$\Delta x = \left(\frac{v_f + v_i}{2}\right)\Delta t \checkmark$$
✓
$$= \left(\frac{0+15}{2}\right)(3,33)\checkmark$$
$= \underline{24,98 \text{ m}}$ ✓

<u>OPTION 3/*OPSIE 3*</u>
POSITIVE MARKING FROM 4.2.1/*POSITIEWE NASIEN VANAF 4.2.1*
$\Delta x = v_i\Delta t + ½\, a\Delta t^2$ ✓
$= (15)(3,33)$ ✓$+ ½\,(-4,5)(3.33)^2$✓
$\Delta x = 25$ m ✓ (4)

4.3 **OPTION 1/*OPSIE 1***

$v_f^2 = v_i^2 + 2a\Delta x$ ✓
0^2 ✓$= 30^2 + 2(-4,5)\Delta x$ ✓
$\Delta x = 100$ m ✓

Car B ✓has a larger stopping distance (100 m > 25 m)✓ /*Kar B het 'n groter stopafstand (100 m > 25 m).*

OPTION 2/*OPSIE 2*

$v_f = v_i + a\Delta t$ ✓
0✓ $= 30 + (-4,5)\Delta t$✓
$\Delta t = 6,67$ s✓

Car B✓ it takes longer to stop hence larger stopping distance ✓/ *Kar B dit neem langer om tot stilstand te kom dus 'n groter stopafstand*

IF/*INDIEN*

Car B ✓ it has a higher velocity than car A and therefore have a larger stopping distance at the same acceleration ✓ Max: (2/6)
Kar B dit het 'n hoër snelheid as kar A en het dus 'n groter stopafstand met dieselfde versnelling Maks: (2/6) (6)

4.4 The greater/larger the speed, the larger the stopping distance ✓ if acceleration is constant. ✓/*Hoe groter die spoed, hoe groter die stopafstand indien versnelling konstant is.* (2)
[18]

QUESTION 5/*VRAAG 5*

5.1 The energy an object has because of its position in the gravitational field ✓ relative to some reference point. ✓ /*Die energie wat 'n voorwerp het as gevolg van die posisie daarvan in die gravitasieveld relatief tot 'n sekere verwysingspunt.* (2)

5.2 $E_p = mgh$✓
$= (65)(9,8)(4,5)$✓
$= 2\,866,5$ J✓ (3)

5.3 The net/total mechanical energy (sum of kinetic and gravitational potential energy) in an isolated/closed system✓ remains constant/ is conserved✓./*Die netto/totale meganiese energie in 'n geïsoleerde/geslote sisteem bly konstant/bly konstant.* (2)

5.4 $(E_p + E_k)_{top/bo} = (E_p + E_k)_{bottom/onder}$
$mgh + 0 = mgh + \frac{1}{2}mv^2$ ✓
$(65)(9,8)(4,5)$✓$= 0 + \frac{1}{2}(65)v^2$ ✓
$v = 9,39\ m\cdot s^{-1}$ ✓

OR/OF

$(E_p + E_k)_{top/bo} = (E_p + E_k)_{bottom/onder}$
$mgh + 0 = mgh + \frac{1}{2}mv^2$ ✓
$2\,866,5$ ✓$= 0 + \frac{1}{2}(65)v^2$ ✓
$v = 9,39\ m\cdot s^{-1}$ ✓ (4)

5.5

OPTION 1/*OPSIE 1*

$(E_p + E_k)_{top/bo} = (E_p + E_k)_{bottom/onder}$ ✓

$mgh + 0 = mgh + ½mv^2$

$(65)(9,8)h$ ✓ $+ 0 = \underline{0 + ½ \times 65 \times (9,39)^2}$ ✓

$637\ h = 2\ 865,6$

$h = 4,49$ m

No✓/*Nee.* h = 4,49 m < 6 m✓

OPTION 2/*OPSIE 2*

$E_{p\ at\ Y} = mgh$ ✓

$= (65)(9,8)(6)$✓

$= 3\ 822$ J✓

$E_{mech} < E_{p\ at\ Y}$ ✓therefore he will not reach point Y ✓/ $E_{meg} < E_{p\ by\ Y}$ *daarom sal hy nie punt Y bereik nie* (5)

[16]

QUESTION 6/*VRAAG 6*

6.1

Difference/*Verskil*	Similarity/*Ooreenkoms*
Amplitudes✓	Wavelength✓/*Golflengte* Period/*Tydperk* Frequency/*Frekwensie* Transverse/*Transversaal* **(Any one)/*(Enige een)***

(2)

6.2.1 A and/*en* B✓

OR/*OF*
C and/*en* D✓

OR/*OF*
B and/en C

OR/*OF*
A and/en D (1)

6.2.2 15 (mm) ✓ (1)

6.3 The <u>number of waves/wave pulses</u>✓ passing a point <u>per second</u>.✓ /*Die <u>getal golwe/golfpulse</u> wat <u>per sekonde</u> by 'n punt verby beweeg.* (2)

6.4.1 $f = \frac{1}{T}$ ✓

$= \frac{1}{1,5}$ ✓

$= 0,67$ Hz ✓ (3)

6.4.2

POSITIVE MARKING FROM 6.4.1 *POSITIEWE NASIEN VANAF 6.1* **OPTION 1/*OPSIE 1***	**OPTION 2/*OPSIE 2***
$v = f\lambda$ ✓ $= (0,67)(0,1)$ ✓ $= 0,067\ m\cdot s^{-1}$ ✓	$v = \frac{\Delta x}{\Delta t}$ **or/of** speed $= \frac{\text{distance}}{\text{time}}$ ✓ $= \frac{0,1}{1,5}$ ✓ $= 0,067\ m\cdot s^{-1}$

(3)
[12]

QUESTION 7/*VRAAG 7*

7.1.1 What is the relationship between the speed of sound and temperature? ✓✓/ *Wat is die verband tussen die spoed van klank en temperatuur?*

OR/*OF*
How will the temperature affect the speed of sound? ✓✓/*Hoe sal die temperatuur die spoed van klank beïnvloed?*

OR/*OF*
What is the relationship between the time taken for the sound to travel and temperature? ✓✓/ *Wat is die verband tussen die spoed van klank en temperatuur?* (2)

Marking criteria/*Nasienriglyne:*	
Dependent and independent variables correctly identified. *Afhanklike en onafhanklike veranderlikes korrek geïdentifiseer.*	✓
Ask a question about the relationship between the independent and dependent variables./*Vra* 'n *vraag oor die verwantskap tussen die afhanklike en onafhanklike veranderlikes.*	✓

7.1.2 Temperature ✓/*Temperatuur* (1)

7.1.3 Speed of sound✓/Time taken for the sound to travel./*Spoed van klank/Tyd geneem vir die klank om te beweeg.* (1)

7.2
$v = \frac{\Delta x}{\Delta t}$ **or/*of*** speed $= \frac{\text{distance}}{\text{time}}$ ✓
$= \frac{50}{0,146}$ ✓
$= 342,47\ m\cdot s^{-1}$ ✓ (3)

7.3 The speed of sound increases / time taken for the sound to travel decreases / as the temperature increases. ✓✓/*Die spoed van klank neem toe / tyd geneem vir die klank om te beweeg neem af soos die temperatuur toeneem.* (2)

7.4 Echo✓/*Eggo* (1)
[10]

QUESTION 8/*VRAAG 8*

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

8.2 Gamma rays ✓/*Gammastrale* (1)

8.3 It has the highest frequency✓ Energy is directly proportional to frequency✓ / E α f /
Dit het die hoogste frekwensie. Energie is direk eweredig aan die frekwenie/ E α f (2)

8.4.1

OPTION 1/*OPSIE 1*	**OPTION 2/*OPSIE 2***
c = fλ✓ 3 x 10^8 = f(600 x 10^{-10}) ✓ f = 5 x 10^{15} Hz ✓ Ultraviolet ✓/*Ultraviolet*	E = $\frac{hc}{\lambda}$ = $\frac{(6{,}63\times10^{-34})(3\times10^{8})}{600\times10^{-10}}$ ✓ = 3,315 x 10^{-18} J E = hf 3,315 x 10^{-18} = (6,63 x 10^{-34})f f = 5x 10^{15} Hz ✓ Ultraviolet ✓/*Ultraviolet*

✓ Any one
Enige een

(4)

8.4.2 **POSITIVE MARKING FROM 8.4.1/*POSITIEWE NASIEN VANAF 8.4.1***
Sterilisation of medical equipment.✓/ *Sterilisasie van mediese toerusting*
Suntan beds /*Sonbeddens*
Security in currency/*Veiligheid in valuta*
Astronomy/ *Astronomie*
(Any one/Any relevant use/*Enige een/Enige relevante gebruik*) (1)
[9]

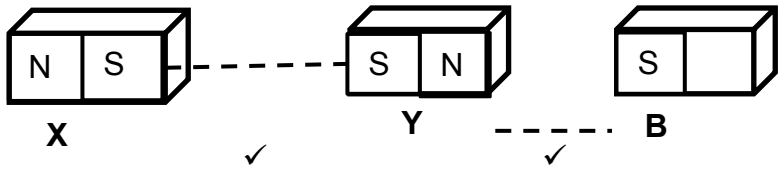
QUESTION 9/*VRAAG 9*

9.1 Ferromagnetic (material) ✓/*Ferromagneties (materiaal)* (1)

9.2 B ✓ (1)

9.3 South ✓/*Suid* (1)

9.4

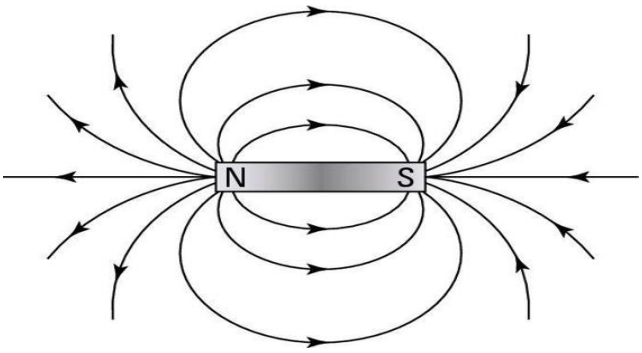


✓ ✓

OR/*OF*
Magnets X repels Y/ South pole ✓/*Magneet X stoot Y af / Suidpool*

Magnet Y attracts B/ South pole at B ✓/*Magneet Y trek B aan* / *Suidpool by B* (2)

9.5



Marking criteria/*Nasienkriteria*	
Correct direction of field lines/*Korrekte rigting van veldlyne*	✓
Shape of the magnetic field/*Vorm van die magneetveld*	✓
No field lines crossing each other/*Geen veldlyne kruis mekaar nie.*	✓

(3)

9.6.1 Less than 5 cm ✓/ *Minder as 5 cm* (1)

9.6.2 Magnitude of magnetic force is inversely proportional to the distance. ✓ B, is no longer attracting Y to the right ✓
Grootte van magnetiese krag is omgekeerd eweredig aan die afstand. B, trek nie meer Y na regs aan nie

OR/*OF*
A decrease in distance increases the magnetic force.✓ B, is no longer attracting Y to the right ✓
'n Afname in afstand laat die magnetiese krag toeneem, B, trek nie meer Y na regs aan nie (2)

[11]

QUESTION 10/*VRAAG 10*

10.1 $n = \frac{Q}{e}$ ✓or/*of* $\frac{Q}{q_e}$

$30 = \frac{Q}{-1{,}6 \times 10^{-19}}$ ✓

$Q = -4{,}8 \times 10^{-18}$ C ✓

<u>Accept/Aanvaar</u>

$n = \frac{Q}{e}$ ✓or/*of* $\frac{Q}{q_e}$

$30 = \frac{Q}{1{,}6 \times 10^{-19}}$ ✓

$Q = 4{,}8 \times 10^{-18}$ C ✓ (3)

10.2 Unlike/opposite charges✓ attract✓/*Ongelyksoortige/teenoorgestelde ladings trek mekaar aan.* (2)

10.3 The net/total charge in an isolated/closed system remains constant/is conserved ✓✓*Die netto/totale lading in 'n geïsoleerde/geslote sisteem bly konstant*. (2)

NOTE/*LET WEL*: If any of the underlined words/phrases are omitted in the correct context: minus 1 mark.) *Indien enige van die onderstreepte woorde/frases in die korrekte konteks weggelaat is: minus een punt.)*

10.4 **POSITIVE MARKING FROM 10.1/POSITIEWE NASIEN VANAF 10.1**

$$Q_{net/netto} = \frac{Q_1 + Q_2}{2} \checkmark$$
$$= \frac{4 \times 10^{-18} \checkmark + (-4{,}8 \times 10^{-18}) \checkmark}{2}$$
$$= -4 \times 10^{-19} \text{ C} \checkmark$$

(4)
[11]

QUESTION 11/*VRAAG 11*

11.1.1 (a) $V_1 = 24$ (V)✓ (1)

(b) $A_1 = 0$ (A)✓ (1)

11.1.2

OPTION 1/*OPSIE 1*	**OPTION 2/*OPSIE 2***
$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2}$ ✓ $= \frac{1}{8} + \frac{1}{8}$ ✓ $R_p = 4\ \Omega$ $R_T = R_s + R_p$ $= 8 + 4$✓ $= 12\ \Omega$✓	$R_p = \frac{\text{product / produk}}{\text{sum / som}}$ ✓ $= \frac{(8)(8)}{8+8}$ ✓ $= 4\ \Omega$ $R_T = R_s + R_p$ $= 8 + 4$✓ $= 12\ \Omega$✓

(4)

11.1.3

OPTION 1/*OPSIE 1*
V divides in a ratio 8 : 4 ✓ (series)/*V verdeel in 'n verhouding 8 : 4 (serie)*
$V_2 = \frac{8}{12} \times 24$✓ or/*of* $V_2 = \frac{2}{3} \times 24$
$= 16$ V ✓

OPTION2 / OPSIE 2
POSITIVE MARKING FROM 11.1.2/*POSITIEWE NASIEN VANAF 11.2.1*
V = IR
24 = I(12)
I = 2 A

V = IR✓
= (2)(8)✓
= 16 V ✓ (3)

11.1.4 $A_2 = A_3$. ✓ (1)

11.2.1 Resistance is directly proportional to the length of the conducting wire. ✓/ *Weerstand is direk eweredig aan die lengte van die geleidingsdraad.*

OR/*OF*

As the length of the wire increases, the resistance increases./*Soos die lengte van die geleidingsdraad toeneem, neem die weerstand toe* (1)

11.2.2 1,35 Ω ✓ (Range/*Variasiewydte*: 1,3 Ω to/*tot* 1,4 Ω) (1)
[12]

TOTAL/*TOTAAL*: 150

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