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)

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MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS/*PUNTE*: 150

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

Approved
DBE-IM
2019/11/18

Approved.
Examiner
18/11/19

QUESTION 1/*VRAAG 1*

1.1 C ✓✓ (2)

1.2 D ✓✓ (2)

1.3 A ✓✓ (2)

1.4 C ✓✓ (2)

1.5 A ✓✓ (2)

1.6 C ✓✓ (2)

1.7 D ✓✓ (2)

1.8 C ✓✓ (2)

1.9 D ✓✓ (2)

1.10 A ✓✓ (2)

[20]

QUESTION 2/*VRAAG 2*

2.1

Total path length travelled.✓✓ **(2 or 0)**
Totale padlengte afgelê. ***(2 of 0)*** (2)

2.2 Original pos./*Oorspronklike pos.* = 10 + 5
= 15 m ✓ west (of tree)/*wes (van boom)* ✓

ACCEPT/*AANVAAR*: 15 m left (of the tree)/*links (van die boom)* (2)

2.3 **POSITIVE MARKING FROM QUESTION 2.2.**
POSITIEWE NASIEN VANAF VRAAG 2.2. (2)

Distance/*Afstand* = 15 + 20 + 25
= 60 m ✓✓

ACCEPT/*AANVAAR:*
Any answer in Q2.2. + 45
Enige antwoord in Q2.2. + 45

2.4

Marking guidelines/*Nasienriglyne*

- Formule/*Formule:* $v = \frac{\Delta x}{\Delta t} / v = \frac{D}{\Delta t}$ ✓
- Subsitute 25 m and 5 $m \cdot s^{-1}$/*Vervang 25 m en 5* $m \cdot s^{-1}$ ✓
- Final answer/*Finale antwoord*: 5 s ✓

OPTION 1/*OPSIE 1*	**OPTION 2/*OPSIE 2***
$v = \frac{\Delta x}{\Delta t}$ ✓	$\Delta x = (\frac{v_i + v_f}{2})\Delta t$ ✓
$5 = \frac{25}{\Delta t}$ ✓	$25 = (\frac{5+5}{2})\Delta t$ ✓
$\Delta t = 5$ s ✓	$\Delta t = 5$ s ✓

(3)

2.5

$v = \frac{\Delta x}{\Delta t}$
$= \frac{10}{40}$ ✓
= 0,25 $m \cdot s^{-1}$ ✓ east/*oos* ✓

Marking guidelines/*Nasienriglyne*
- Subsitute/*Vervang* 10 m & 40 s ✓
- Final answer/Finale antwoord: 0,25 $m \cdot s^{-1}$ ✓
- Direction/*Rigting*: East/*Oos*/Right/*Regs* ✓

(3)
[12]

QUESTION 3/*VRAAG 3*

3.1 A physical quantity with magnitude and direction.✓✓ **(2 or 0)**
'n Fisiese hoeveelheid met grootte en rigting. ***(2 of 0)*** (2)

3.2 67 x 3,6 = 241,2 ($km \cdot h^{-1}$) ✓ (1)

3.3

3.3.1 $v_f = v_i + a\Delta t$ ✓
8 = 67 + a(30) ✓
∴ a = - 1,97 $m \cdot s^{-2}$
∴ a = 1,97 $m \cdot s^{-2}$ in the opposite direction/*in die teenoorgestelde rigting* ✓

ACCEPT/*AANVAAR*: west/*wes*/to the left/*na links* (4)

3.3.2

Marking guidelines/*Nasienriglyne*

- Formule/*Formule:* $\Delta x = (\frac{v_i + v_f}{2})\Delta t$ / $\Delta x = v_i t + \frac{1}{2}a\Delta t^2$ / $v_f^2 = v_i^2 + 2a\Delta x$ ✓
- Subsitute velocity in relevant formula./*Vervang snelheid in geskikte formule.* ✓
- Substitute time/acceleration in relevant formula/*Vervang tyd/versnelling in geskikte formule.* ✓
- Final answer/*Finale antwoord*: 1 125 m ✓

Range/*Gebied*: 1 123,1 to/*tot* 1 125 m

POSITIVE MARKING FROM QUESTION 3.3.1.
POSITIEWE NASIEN VANAF VRAAG 3.3.1.

OPTION 1/*OPSIE 1*

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

$= \left(\frac{8 + 67}{2}\right)30$ ✓

$= 1125$ m ✓

OPTION 2/*OPSIE 2*

$\Delta x = v_i\Delta t + \frac{1}{2}a\Delta t^2$ ✓

$= (67)(30)$ ✓ $+ \frac{1}{2}(-1{,}97)(30)^2$ ✓

$= 1\,123{,}5$ m ✓

OPTION 3/*OPSIE 3*

$v_f^2 = v_i^2 + 2a\Delta x$ ✓

$(8)^2 = (67)^2 + 2(-1{,}97)\Delta x$ ✓

$\Delta x = 1\,123{,}1$ m ✓

(4)

3.3.3

OPTION 1/*OPSIE 1*

$\Delta x = v_i\Delta t + \frac{1}{2}a\Delta t^2$ ✓

$800 = 8\Delta t + \frac{1}{2}(0)\Delta t^2$ ✓

$\Delta t = 100$ s ✓

OPTION 2/*OPSIE 2*

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

$800 = (\frac{8 + 8}{2})\Delta t$ ✓

$\Delta t = 100$ s ✓

OPTION 3/*OPSIE 3*

$v = \frac{D}{\Delta t}$ ✓

$8 = \frac{800}{\Delta t}$ ✓

$\Delta t = 100$ s ✓

(3)

3.3.4 **POSITIVE MARKING FROM QUESTION 3.3.2.**
POSITIEWE NASIEN VANAF VRAAG 3.3.2.

Length/*Lengte* = 2000 – 800 – 1 125
= 75 m ✓✓

ACCEPT/*AANVAAR:*
2 000 – 800 - any answer in Q3.3.2
2 000 – 800 - enige antwoord in Q3.3.2

(2)

3.4

3.4.1 Decreases/*Verlaag* ✓ (1)

3.4.2 On a wet runway, the tyres have less grip, ✓ and to stop within the same distance, ✓ the landing speed should be less.
Op 'n nat landingstrook het die bande minder greep en om in dieselfde afstand tot stilstand te kom, moet die landingspoed kleiner wees. (2)

[19]

QUESTION 4/*VRAAG 4*

4.1

Marking guidelines/*Nasienriglyne*
If any of the underlined key words/phrases in the correct context are omitted: minus 1 mark
Indien enige van die onderstreepte sleutelwoorde/frases in die korrekte konteks uitgelaat is: minus 1 punt

Rate of change of position./Change of position per (unit) time. ✓✓ **(2 or 0)**
Tempo waarteen posisie verander./Verandering in posisie per (eenheid)tyd. ***(2 of 0)*** (2)

4.2

From C to D:
- The car turns around / moves south / moves in opposite direction. ✓
- Increased velocity / Constant acceleration / Velocity increases from 0 $m \cdot s^{-1}$ to 6 $m \cdot s^{-1}$ ✓

From point D to E:
- The car travels at a constant velocity south/in the opposite direction. ✓

Van C na D:
- *Die motor draai om / beweeg suid / beweeg in teenoorgestelde rigting.* ✓
- *Toenemende snelheid / Konstante versnelling / Snelheid neem toe van 0 $m \cdot s^{-1}$ na 6 $m \cdot s^{-1}$* ✓

Van D tot E:
- *Die motor beweeg teen 'n konstante snelheid suid/in die teenoorgestelde rigting.*

(3)

4.3.1

Marking criteria/*Nasienriglyne*
- Any area formula/*Enige oppervlak-formule*:
  Area = L x B/Area = ½ b⊥h/Area ½(sum/*som* || sides/*sye*)⊥h ✓
- Substitution of values from graph./*Vervanging van waardes vanaf grafiek.* ✓✓
- Final answer/*Finale antwoord*: 40 m ✓

OPTION 1/*OPSIE 1*	**OPTION 2/*OPSIE 2***
Area A-B/*Oppervlak A-B*: A = L x B ✓ = 10 x 2 ✓ = 20 m Area B-C/*Oppervlak* B-C: A = ½ b⊥h = ½(4)(10) ✓ = 20 m Total distance/*Totale afstand* = 40 m ✓	Area of trapezium/*Oppervlak van trapesium:* A = ½(sum/*som* || sides/*sye*)⊥h ✓ = ½(2 + 6) ✓ (10) ✓ = 40 m ✓

(4)

4.3.2

$$m = \frac{\Delta v}{\Delta t} / \frac{\Delta y}{\Delta x}$$
$$= \frac{0-10}{6-2} \checkmark$$
$$= -2,5 \checkmark$$
a = 2,5 $m \cdot s^{-2}$ south/*suid* ✓

(4)

4.4 Greater than/*Groter as* ✓ (1)

4.5 Slope of the graph at B-C is steeper than C-D. ✓
Die helling van die grafiek is steiler by B-C as by C-D.

OR/*OF*

Gradient of CD/*Gradiënt van CD* = $\frac{-6 - 0}{10 - 6}$ = - 1,5 ($m \cdot s^{-2}$) ✓ (1)

4.6 North/*Noord* ✓ (1)

4.7 **POSITIVE MARKING FROM QUESTION 4.3.2.**
POSITIEWE NASIEN VANAF VRAAG 4.3.2.

$v_f = v_i + a\Delta t$ ✓
= 10 + (- 2,5)(3) ✓ **OR/*OF*** 5 + (-2,5)(1) **OR/*OF*** 7,5 + (-2,5)(2)
v_f = 2,5 $m \cdot s^{-1}$ ✓ north/*noord* ✓ (4)

[20]

QUESTION 5/*VRAAG 5*

Penalise ONLY ONCE for incorrect conversion of units in this question.
Penaliseer SLEG EEN MAAL vir verkeerde omskakeling van eenhede in hierdie vraag.

5.1 Mechanical energy / *Meganiese energie* ✓ (1)

5.2.1 $E_m = E_k + E_p$
$= \frac{1}{2} mv^2 + mgh$ ✓ Any one/*Enige een*
$= \frac{1}{2}(2)(1,71)^2$ ✓ + (2)(9,8)(0,3) ✓
= 8,8 J ✓ (4)

5.2.2 **POSITIVE MARKING FROM QUESTION 5.2.**
POSITIEWE NASIEN VAN VRAAG 5.2.

OPTION 1/*OPSIE 1*

$Em_A = Em_D$
$\frac{1}{2}m_A v_A^2 + m_A gh = \frac{1}{2}m_D v_D^2 + m_D gh$ ✓ Any one/*Enige een*
$0 + (2)(9,8)h = 8,8$ ✓
$h = 0,45$ m ✓ (3)

OPTION 2/*OPSIE 2*
[E_p = mgh and/*en* E_k = 0] ✓
8,8 = (2)(9,8)h ✓
h = 0,45 m ✓

IF/*INDIEN:*
E_p = mgh
8,8 = (2)(9,8)h ✓
h = 0,45 m ✓ Max/Maks. $^2/_3$

5.2.3 **POSITIVE MARKING FROM QUESTION 5.2.2.**
POSITIEWE NASIEN VAN VRAAG 5.2.2.
$E_{mA} = E_{mB}$
$0 + \underline{(2)(9,8)(0,45)}$ ✓ $= \underline{\frac{1}{2}(2)v^2 + (2)(9,8)(0,05)}$ ✓
$\therefore v = 2,8\ m{\cdot}s^{-1}$ ✓

OR/*OF*
POSITIVE MARKING FROM QUESTION 5.2.1.
POSITIEWE NASIEN VAN VRAAG 5.2.1.
$E_{mD} = E_{mC}$
$8,8$ ✓ $= \underline{\frac{1}{2}(2)v^2 + (2)(9,8)(0,05)}$ ✓
$\therefore v = 2,8\ m{\cdot}s^{-1}$ ✓ (3)

5.3 Equal to/*Gelyk aan* ✓

The speed is independent of the mass of the object. ✓
Die spoed is onafhanklik van die massa van die voorwerp.

OR/*OF*
Speed only depends on the initial height.
Spoed hang slegs van die aanvanklike hoogte af. (2)
[13]

QUESTION 6/*VRAAG 6*

6.1

Marking guidelines/*Nasienriglyne*
If any of the underlined key words/phrases in correct context are omitted: minus 1 mark
Indien enige van die onderstreepte sleutelwoorde/frases in die korrekte konteks uitgelaat is: minus 1 punt

The maximum disturbance of a particle from its rest/equilibrium position. ✓✓
Maksimum versteuring van 'n deeltjie vanaf sy rusposisie/ewewigsposisie. (2)

6.2 0,5 (m) ✓ (1)

6.3 T = 8 s ✓ (8 seconds/*sekondes*) (1)

6.4.1 **POSITIVE MARKING FROM QUESTION 6.3.**
POSITIEWE NASIEN VAN VRAAG 6.3.

Marking guidelines/*Nasienriglyne*

- Formula/*Formule:* $f = \frac{1}{T}$ ✓
- Substitute period or time./*Vervang periode of tyd.* ✓
- Formula/*Formule:* $v = f\lambda$ ✓
- Substitute f and λ./*Vervang f en* λ.✓
- Final answer/*Finale antwoord:* 0,1 $m \cdot s^{-1}$ ✓

OPTION 1/*OPSIE 1*

$f = \frac{1}{T}$ ✓

$= \frac{1}{8}$ ✓

$= 0,125$ Hz

$v = f\lambda$ ✓

$= (0,125)(0,8)$ ✓

$= 0,1 \text{ m} \cdot \text{s}^{-1}$ ✓

OPTION 2/*OPSIE 2*

$\text{Frequency} = \frac{\text{number of waves}}{\text{time}}$ ✓

$= \frac{2}{16}$ ✓

$= 0,125$ Hz

$v = f\lambda$ ✓

$= (0,125)(0,8)$ ✓

$= 0,1 \text{ m} \cdot \text{s}^{-1}$ ✓

OPTION 3/*OPSIE 3*

$v = \frac{\lambda}{T}$ ✓✓ $= \frac{0,8}{8}$ ✓ $= 0,1 \text{ m} \cdot \text{s}^{-1}$ ✓

(5)

6.4.2 **POSITIVE MARKING FROM QUESTION 6.4.1.**
POSITIEWE NASIEN VAN VRAAG 6.4.1.

OPTION 1/*OPSIE 1*

Distance/*Afstand* = (2½)(0,8) ✓
= 2 m ✓

OPTION 2/*OPSIE 2*

$v = \frac{D}{\Delta t}$ /speed = $\frac{\textit{distance}}{\textit{time}}$ / *spoed* = $\frac{\textit{afstand}}{\textit{tyd}}$

$0,1 = \frac{D}{20}$ ✓

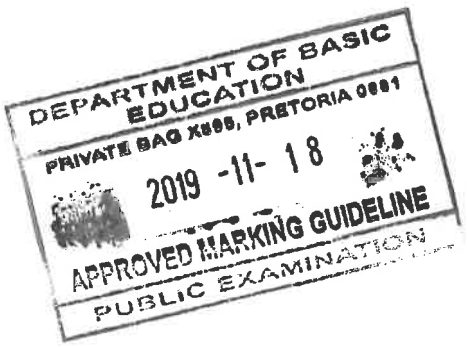
D = 2 m ✓

(2)

6.5

6.5.1 Greater than/*Groter as* ✓ (1)

6.5.2 Greater than/*Groter as* ✓ (1)



6.6

OPTION 1/*OPSIE 1*

$$\text{Frequency} = \frac{\text{vibrations}}{\text{time}} \text{ / } \textit{Frekwensie} = \frac{\textit{vibrasies}}{\textit{tyd}} \checkmark$$

$$= \frac{5}{20} \checkmark$$

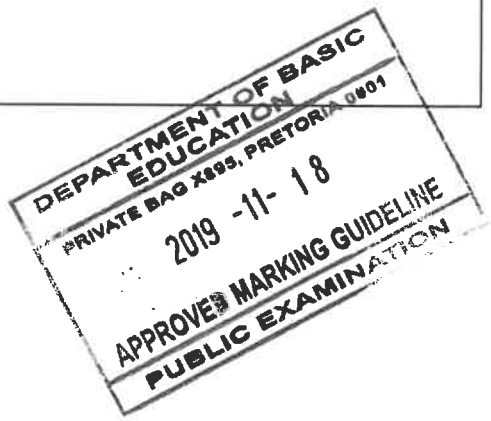
$$= 0{,}25 \text{ Hz} \checkmark$$

OPTION 2/*OPSIE 2*

$$f = \frac{1}{T} \checkmark$$

$$= \frac{1}{4} \checkmark$$

$$= 0{,}25 \text{ Hz} \checkmark$$



(3)
[16]

QUESTION 7/*VRAAG 7*

7.1

Marking guidelines/*Nasienriglyne*
If any of the underlined key words/phrases in the correct context are omitted: minus 1 mark
Indien enige van die onderstreepte sleutelwoorde/frases in die korrekte konteks uitgelaat is: minus 1 punt
IF the word "perpendicular" is used:/***INDIEN*** *die woord "loodreg" gebruik word:* $^0/_2$

A wave in which the particles of the medium vibrate parallel to the direction of motion of the wave. ✓✓
'n Golf waarin die deeltjies van die medium parallel vibreer met die rigting van beweging van die golf.

(2)

7.2

OPTION 1/*OPSIE 1*	**OPTION 2/*OPSIE 2***	**Marking guidelines/ *Nasienriglyne***
$v = \frac{\Delta x}{\Delta t}$ ✓ $340 \overset{\checkmark}{=} \frac{\Delta x}{4}$ ✓ $\Delta x = 1360 \text{ m}$ ✓	$v = \frac{\Delta x}{\Delta t}$ ✓ $340 \overset{\checkmark}{=} \frac{\Delta x}{8}$ $\Delta x = 2720 \text{ m}$ $D = 2720 \div 2$ ✓ $= 1360 \text{ m}$ ✓	• Formula/*Formule:* $v = \frac{\Delta x}{\Delta t}$ ✓ • Substitute/*Vervang* 340 $\text{m}\cdot\text{s}^{-1}$. ✓ • Divide time or final distance by 2/*Deel tyd of finale afstand deur 2.* ✓ • Final answer/*Finale antwoord:* 1 360 m ✓

(4)

7.3 Frequency/*Frekwensie* ✓ (1)

7.4 20 kHz / 20 000 Hz ✓ (1)

7.5 Diagnosis of medical condition/pregnancy/Sonar/Measure blood flow. ✓
Diagnose van medies toestand/swangerskap/Sonar/Meet van bloedvloei. (1)
[9]

QUESTION 8/*VRAAG 8*

8.1 An oscillating electric field (in one plane) produces an (oscillating) magnetic field ✓ at right angles/perpendicular to it. ✓
'n Ossilerende elektriese veld (in een vlak) produseer 'n (ossilerende) magneetveld wat loodreg daarop is. (2)

8.2 The higher the frequency, the higher the energy of the wave. ✓✓ **(2 or 0)**
Hoe hoër die frekwensie, hoe hoër is die energie van die golf. ***(2 of 0)***

OR/*OF*
Frequency is directly proportional to energy.
Frekwensie is direk eweredig aan energie. (2)

8.3
8.3.1 $E = hf$ ✓
$4,97 \times 10^{-14} = 6,63 \times 10^{-34} f$ ✓
$f = 7,5 \times 10^{19}$ Hz ✓ $(7,4962 \times 10^{19}$ Hz) (3)

8.3.2

OPTION 1/*OPSIE 1*	**OPTION 2/*OPSIE 2***
$c = f\lambda$ ✓ $3 \times 10^8 = (1,8 \times 10^{18})\lambda$ ✓ $\lambda = 1,67 \times 10^{-10}$ m ✓ **ACCEPT/*AANVAAR*:** Formula/*Formule*: $v = f\lambda$	$E = \frac{hc}{\lambda}$ ✓ $1,19 \times 10^{-15} = \frac{(6,63 \times 10^{-34})(3 \times 10^8)}{\lambda}$ ✓ $\lambda = 1,67 \times 10^{-10}$ m ✓

(3)

8.4 B ✓
Highest frequency/energy✓
Hoogste frekwensie/energie. (2)
[12]

QUESTION 9/*VRAAG 9*

9.1 Materials that are (strongly) attracted by magnets ✓ and can be (easily) magnetised. ✓
Materiale wat baie (sterk) aangetrek word deur magnete en wat (maklik) gemagnetiseer kan word. (2)

9.2 South/*Suid* ✓ (1)

9.3 (Position) 1/*Posisie 1* ✓
Magnetic field is strongest at the poles of a magnet. ✓
Magneetveld is die sterkste by die pole van magneet. (2)

9.4 North to South ✓
Noord na Suid (1)

9.5

9.5.1 Geographic north pole ✓ **ACCEPT:** True north
Geografiese noordpool ***AANVAAR:*** *Ware noord* (1)

9.5.2 Magnetic north pole ✓
Magnetiese noordpool (1)

9.6 Protection from solar winds. ✓
Beskerming teen sonwinde. (1)
[9]

QUESTION 10/*VRAAG 10*

10.1 $Q = nq_e$ ✓
$-3 \times 10^{-6} = n(-1,6 \times 10^{-19})$ ✓
$n = 1,88 \times 10^{13}$ ✓ (3)

10.2 $Q = \frac{Q_1 + Q_2}{2}$ ✓

$-1 \times 10^{-6} = \frac{(-3 \times 10^{-6}) + Q_{2/Q}}{2}$ ✓

$Q_{2/Q} = 1 \times 10^{-6}$ C ✓ (3)

10.3 **P** to/*na* **Q** ✓ (1)
[7]

QUESTION 11/*VRAAG 11*

11.1 A charge of 5 C ✓ flows (past a point) in one second/per second. ✓
'n Lading van 5 C vloei verby 'n punt in een sekonde/per sekonde. (2)

11.2

OPTION 1/*OPSIE 1*	**OPTION 2/*OPSIE 2***
$\frac{1}{R_p}=\frac{1}{R_1}+\frac{1}{R_2}$ ✓ $\frac{1}{R_p}=\frac{1}{4}+\frac{1}{6}$ ✓ $R_p = 2,4\ \Omega$ ✓	$R_p=\frac{R_1 R_2}{R_1+R_2}$ ✓ $=\frac{(4)(6)}{4+6}$ ✓ $= 2,4\ \Omega$ ✓

(3)

11.3 V_1 ✓ (1)

11.4 Smaller than/*Kleiner as* ✓ (1)

11.5
$Q = I\Delta t$ ✓
$0,3 = I(2)$ ✓
$I = 0,15\ A$ ✓ (3)

11.6
$V=\frac{W}{Q}$ ✓
$5=\frac{W}{0,3}$ ✓
$W = 1,5\ J$ ✓ (3)

[13]

TOTAL/*TOTAAL*: 150