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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 2019**

**MARKING GUIDELINES/NASIENRIGLYNE**

**MARKS/PUNTE: 150**

**These marking guidelines consist of 11 pages./  
Hierdie nasienriglyne bestaan uit 11 bladsye.**

## 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 Marking guidelines/Nasienriglyne**

If any of the underlined key words/phrases are omitted: minus 1 mark

*Indien enige van die onderstreepte sleutelwoorde/frases uitgelaat is: minus 1 punt*

Total path length travelled. ✓✓

Totale padlengte afgelê.

(2)

2.2 Original pos./Oorspronklike posisie = 10 + 5

= 15 m ✓ west of tree/wes van 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

$$v = \frac{\Delta x}{\Delta t} \checkmark$$

$$5 = \frac{25}{\Delta t} \checkmark$$

$$\Delta t = 5 \text{ s} \checkmark$$

**Marking guidelines/Nasienriglyne**

- Formule/Formule:  $v = \frac{\Delta x}{\Delta t} / v = \frac{D}{\Delta t} \checkmark$

- Substitute 25 m and 5 m·s<sup>-1</sup> ✓

- Final answer/Finale antwoord: 5 s ✓

(3)

2.5

$$v = \frac{\Delta x}{\Delta t}$$

$$= \frac{10}{40} \checkmark$$

$$= 0,25 \text{ m} \cdot \text{s}^{-1} \checkmark \text{ east/oos} \checkmark$$

**Marking guidelines/Nasienriglyne**

- Substitute 25 m and 5 m·s<sup>-1</sup> ✓

- Final answer/Finale antwoord: 0,25 m·s<sup>-1</sup> ✓

- Direction/Rigting: East/Oos ✓

(3)

**[12]****QUESTION 3/VRAAG 3**

3.1 A physical quantity with magnitude and direction. ✓✓

*'n Fisiese hoeveelheid met grootte en rigting.*

(2)

3.2  $67 \times 3,6 = \underline{241,2 \text{ km} \cdot \text{h}^{-1}} \checkmark$

(1)

3.3

3.3.1  $v_f = v_i + a\Delta t \checkmark$

$$\underline{8 = 67 + a(30)} \checkmark$$

$$\therefore a = -1,97 \text{ m} \cdot \text{s}^{-2} \checkmark$$

$$\therefore a = \underline{1,97 \text{ m} \cdot \text{s}^{-2} \text{ in the opposite direction/in die teenoorgestelde rigting}} \checkmark$$

(4)

3.3.2

**Marking guidelines/Nasienriglyne**

- Formule/Formule:  $\Delta x = \left(\frac{v_i + v_f}{2}\right)\Delta t$  /  $\Delta x = v_i t + \frac{1}{2}a\Delta t^2$  /  $v_f^2 = v_i^2 + 2a\Delta x$  ✓
- Substitute 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**

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

$$= \left(\frac{8 + 67}{2}\right)30 \quad \checkmark$$

$$= 1125 \text{ m} \quad \checkmark$$

**OPTION 2/OPSIE 2**

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

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

$$= 1123,5 \text{ m} \quad \checkmark$$

**OPTION 3/OPSIE 3**

$$v_f^2 = v_i^2 + 2a\Delta x \quad \checkmark$$

$$(8)^2 = (67)^2 + 2(-1,97)\Delta x \quad \checkmark$$

$$\Delta x = 1123,1 \text{ m} \quad \checkmark$$

(4)

3.3.3

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

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

$$\Delta t = 100 \text{ s} \quad \checkmark$$

(3)

3.3.4

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

$$\text{Length/Lengte} = 2000 - 800 - 1125$$

$$= 75 \text{ m} \quad \checkmark \checkmark$$

**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 are omitted: minus 1 mark

*Indien enige van die onderstreepte sleutelwoorde/frases uitgelaat is: minus 1 punt*Rate of change of position. ✓✓Tempo waarteen posisie verander.

(2)

4.2

**From C to D:**

The car turns around/moves south/moves in opposite direction/moves with velocity that increases from  $0 \text{ m} \cdot \text{s}^{-1}$  to  $6 \text{ m} \cdot \text{s}^{-1}$ . ✓  
 at an increased velocity/constant acceleration. ✓

**From point D to E:**

The car travels at a constant velocity south. ✓

**Van C na D:**

Motor draai om/beweeg suid/beweeg in teenoorgestelde rigting/beweeg teen 'n snelheid wat van  $0 \text{ m} \cdot \text{s}^{-1}$  na  $6 \text{ m} \cdot \text{s}^{-1}$  toeneem.  
 met 'n toename in snelheid/konstante versnelling.

**Van D tot E:**

Die motor beweeg teen 'n konstante snelheid suid.

(3)

4.3

4.3.1

**Marking criteria/Nasienriglyne**

- Any area formula/Enige oppervlak-formule:  
 $\text{Area} = L \times B / \text{Area} = \frac{1}{2} b \perp h / \text{Area} \frac{1}{2}(\text{sum/som} \parallel \text{sides/sye}) \perp h$  ✓
- Substitution of values from graph./Vervanging van waardes vanaf grafiek. ✓✓
- Final answer/Finale antwoord: 40 m ✓

**OPTION 1/OPSIE 1**

Area A-B/Oppervlak A-B:

$$\begin{aligned}
 A &= L \times B \quad \checkmark \\
 &= 10 \times 2 \quad \checkmark \\
 &= 20 \text{ m}
 \end{aligned}$$

Area B-C/Oppervlak B-C:

$$\begin{aligned}
 A &= \frac{1}{2} b \perp h \\
 &= \frac{1}{2}(4)(10) \quad \checkmark \\
 &= 20 \text{ m}
 \end{aligned}$$

Total distance/Totale afstand = 40 m ✓

**OPTION 2/OPSIE 2**

Area of trapezium/Oppervlak van trapesium:

$$\begin{aligned}
 A &= \frac{1}{2}(\text{sum/som} \parallel \text{sides/sye}) \perp h \quad \checkmark \\
 &= \frac{1}{2}(2 + 6) \quad \checkmark (10) \quad \checkmark \\
 &= 40 \text{ m} \quad \checkmark
 \end{aligned}$$

(4)

4.3.2

$$\begin{aligned}
 m &= \frac{\Delta v}{\Delta t} / \frac{\Delta y}{\Delta x} \\
 &= \frac{0 - 10}{6 - 2} \quad \checkmark \\
 &= -2,5 \quad \checkmark \\
 a &= \underline{2,5 \text{ m} \cdot \text{s}^{-2}} \text{ south/suid} \quad \checkmark
 \end{aligned}$$

(4)

- 4.4 Smaller than/Kleiner as ✓
- 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. (1)
- 4.6 North/Noord ✓ (1)
- 4.7 **POSITIVE MARKING FROM QUESTION 4.3.2.**  
**POSITIEWE NASIEN VANAF VRAAG 4.3.2.**  
 $v_f = v_i + a\Delta t$  ✓  
 $v_f = 10 + (-2,5)(5)$  ✓  
 $v_f = -2,5 \text{ m} \cdot \text{s}^{-1}$  ✓  
 $v_f = 2,5 \text{ m} \cdot \text{s}^{-1}$  north/noord ✓ (4)

[20]

## QUESTION 5/VRAAG 5

- 5.1 Mechanical energy ✓  
Meganiese energie (1)
- 5.2
- 5.2.1  $E_m = E_k + E_p$  } ✓ Any one/Enige een  
 $= \frac{1}{2}mv^2 + mgh$   
 $= \frac{1}{2}(2)(1,71)^2 + (2)(9,8)(0,3)$  ✓  
 $= 8,8 \text{ J}$  ✓ (4)
- 5.2.2 **POSITIVE MARKING FROM QUESTION 5.2.**  
**POSITIEWE NASIEN VAN VRAAG 5.2.**  
 $E_{m_A} = E_{m_D}$  } ✓ Any one/Enige een  
 $\frac{1}{2}m_A v_A^2 + m_A gh = \frac{1}{2}m_D v_D^2 + m_D gh$   
 $0 + (2)(9,8)h = 8,8$  ✓  
 $h = 0,45 \text{ m}$  ✓ (3)
- 5.2.3 **POSITIVE MARKING FROM QUESTION 5.3.**  
**POSITIEWE NASIEN VAN VRAAG 5.3.**  
 $E_{m_A} = E_{m_B}$   
 $0 + (2)(9,8)(0,45) = \frac{1}{2}(2)v^2 + (2)(9,8)(0,05)$  ✓  
 $\therefore v = 2,8 \text{ m} \cdot \text{s}^{-1}$  ✓ (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 are omitted: minus 1 mark

*Indien enige van die onderstreepte sleutelwoorde/frases uitgelaat is: minus 1 punt*

The maximum disturbance of a particle from its rest position. ✓✓

*Maksimum versteuring van 'n deeltjie vanaf sy rusposisie.*

(2)

6.2

0,5 m ✓

(1)

6.3

T = 8 seconds/sekondes ✓

(1)

6.4

### **POSITIVE MARKING FROM QUESTION 6.3.**

### **POSITIEWE NASIEN VAN VRAAG 6.3.**

6.4.1

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

$$= \frac{1}{8} \checkmark$$

$$= 0,125 \text{ Hz}$$

$$v = f\lambda \checkmark$$

$$= (0,125)(0,8) \checkmark$$

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

### **Marking guidelines/Nasienriglyne**

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

(5)

6.4.2

### **POSITIVE MARKING FROM QUESTION 6.4.1.**

### **POSITIEWE NASIEN VAN VRAAG 6.4.1.**

#### **OPTION 1/OPSIE 1**

$$\text{Distance/Afstand} = (2\frac{1}{2})(0,8) \checkmark$$

$$= 2 \text{ m} \checkmark$$

#### **OPTION 2/OPSIE 2**

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

$$0,1 = \frac{D}{20} \checkmark$$

$$D = 2 \text{ m} \checkmark$$

(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**

$$\begin{aligned}\text{Frequency} &= \frac{\text{vibrations}}{\text{time}} / \text{Frekwensie} = \frac{\text{vibrasies}}{\text{tyd}} \checkmark \\ &= \frac{5}{20} \checkmark \\ &= 0,25 \text{ Hz} \checkmark\end{aligned}$$

**OPTION 2/OPSIE 2**

$$\begin{aligned}f &= \frac{1}{T} \checkmark \\ &= \frac{1}{4} \checkmark \\ &= 0,25 \text{ Hz} \checkmark\end{aligned}$$

(3)  
[16]

**QUESTION 7/VRAAG 7**

7.1

**Marking guidelines/Nasienriglyne**

If any of the underlined key words/phrases are omitted: minus 1 mark

*Indien enige van die onderstreepte sleutelwoorde/frases uitgelaat is: minus 1 punt*

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**

$$\begin{aligned}v &= \frac{\Delta x}{\Delta t} \checkmark \\ 340 &= \frac{\Delta x}{4} \checkmark \\ \Delta x &= 1360 \text{ m} \checkmark\end{aligned}$$

**OPTION 2/OPSIE 2**

$$\begin{aligned}v &= \frac{\Delta x}{\Delta t} \checkmark \\ 340 &= \frac{\Delta x}{8} \checkmark \\ \Delta x &= 2720 \text{ m} \\ D &= 2720 \div 2 \\ &= 1360 \text{ m} \checkmark\end{aligned}$$

**Marking guidelines/Nasienriglyne**

- 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 ✓

(1)

7.5 Diagnosis of medical condition/pregnancy. ✓  
*Diagnose van medies toestand/swangerskap.*

(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. ✓✓

Hoe hoër die frekwensie, hoe hoër is die energie van die golf.

**OR/OF**

Frequency is directly proportional to energy.

Frekwensie is direk eweredig aan energie.

(2)

8.3

8.3.1

$$E = hf \checkmark$$

$$4,97 \times 10^{-14} = 6,67 \times 10^{-34} f \checkmark$$

$$f = 7,5 \times 10^{19} \text{ Hz } \checkmark$$

(3)

8.3.2

### OPTION 1/OPSIE 1

$$c = f\lambda \checkmark$$

$$3 \times 10^8 = (1,8 \times 10^{18})\lambda \checkmark$$

$$\lambda = 1,67 \times 10^{-10} \text{ m } \checkmark$$

### OPTION 2/OPSIE 2

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

$$1,19 \times 10^{-15} = \frac{(6,63 \times 10^{-34})(3 \times 10^8)}{\lambda} \checkmark$$

$$\lambda = 1,67 \times 10^{-10} \text{ m } \checkmark$$

(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 are easily magnetised. ✓

*Materiale wat baie sterk aangetrek word deur magnete en wat maklik magnetiseer.*

(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 ✓

*Geografiese noordpool*

(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

$$Q = nq_e \checkmark$$

$$3 \times 10^{-6} = n(1,6 \times 10^{-19}) \checkmark$$

$$n = 1,88 \times 10^{13} \checkmark$$

(3)

10.2

$$Q = \frac{Q_P + Q_Q}{2} \checkmark$$

$$-1 \times 10^{-6} = \frac{(-3 \times 10^{-6}) + Q_Q}{2} \checkmark$$

$$Q_Q = 1 \times 10^{-6} \text{ C} \checkmark$$

(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  $\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2}$  ✓  
 $\frac{1}{R_p} = \frac{1}{4} + \frac{1}{6}$  ✓  
 $R_p = 2,4 \Omega$  ✓ (3)

11.3  $V_1$  ✓ (1)

11.4  $V_2$  is smaller than/ *kleiner as*  $V_1$ . ✓ (1)

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

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

**[13]****TOTAL/TOTAAL: 150**