



Province of the  
**EASTERN CAPE**  
EDUCATION

**NATIONAL  
SENIOR CERTIFICATE/  
NASIONALE SENIOR SERTIFIKAAT**

**GRADE/GRAAD 12**

**JUNE/JUNIE 2021**

**TECHNICAL SCIENCES P1/  
TEGNIESE WETENSKAPPE V1  
MARKING GUIDELINE/NASIENRIGLYN  
(EXEMPLAR/EKSEMPLAAR)**

**MARKS/PUNTE: 150**

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This marking guideline consists of 9 pages./  
*Hierdie nasienriglyn bestaan uit 9 bladsye.*

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**QUESTION/VRAAG 1**

- |      |      |             |
|------|------|-------------|
| 1.1  | A ✓✓ | (2)         |
| 1.2  | D ✓✓ | (2)         |
| 1.3  | C ✓✓ | (2)         |
| 1.4  | A ✓✓ | (2)         |
| 1.5  | B ✓✓ | (2)         |
| 1.6  | C ✓✓ | (2)         |
| 1.7  | D ✓✓ | (2)         |
| 1.8  | A ✓✓ | (2)         |
| 1.9  | D ✓✓ | (2)         |
| 1.10 | D ✓✓ | (2)         |
|      |      | <b>[20]</b> |

## QUESTION/VRAAG 2

- 2.1 2.1.1  $F_1 = \text{Normal force/Normaalkrag}$  ✓ (1)
- 2.1.2  $F_2 = \text{Weight/Gewig}$  ✓ (1)
- 2.2 2.2.1 Force of the block on the EARTH/Krag van die blok op die AARDE ✓ (2)
- 2.2.2  $F_4 = mg$  ✓  
 $= 5 \times 9,8$  ✓  
 $= 49 \text{ N}$  ✓ (3)
- 2.3.1 Newton's First Law/*Newton se Eerste Wet* ✓
-  A body will remain at rest or continue moving with constant velocity unless a net force acts on it. ✓✓  
*'n Voorwerp sal in rus bly of beweeg teen 'n konstante snelheid tensy 'n netto krag daarop inwerk.* ✓✓ (3)
- 2.3.2  $F_{\text{net}} = 0 \text{ N}$  ✓ (1)
- [11]

## QUESTION/VRAAG 3

3.1 3.1.1 To ensure that tension is uniform. ✓✓  
*Om te verseker dat die spanning uniform is.* (2)

3.1.2 A net force produces acceleration of an object in the direction of the net force. The acceleration is directly proportional to the net force and inversely proportional to the mass of the object. ✓✓  
*'n Netto krag veroorsaak dat 'n voorwerp versnel in die rigting van die netto krag. Hierdie versnelling is direk eweredig aan die netto krag en omgekeerd eweredig aan die massa van die voorwerp.* ✓✓ (2)

## OR/OF

The net force acting on a body is equal to the rate of change of momentum in the same direction as the net force.  
*Die netto krag wat op 'n voorwerp inwerk is gelyk aan die tempo van verandering van momentum in dieselfde rigting as die netto krag.*

3.1.3  $F_H = F \cos \theta$  ✓  
 $= 40 \cos 35^\circ$  ✓  
 $= 32,77 \text{ N}$

$F_{\text{net}} = ma$  ✓

**80 kg mass/massa:**

$F_{\text{net}} = ma$

$T - 6 = 80 a$  ✓

**50 kg mass/massa:**

$F_{\text{net}} = ma$

$32,77 - T = 50 a$  ✓

$a = 0,21 \text{ m}\cdot\text{s}^{-2}$  ✓

(7)

3.1.4 DECREASES ✓ Horizontal component (of 40 N force) decreases ✓✓  
*NEEM AF ✓ Horisontale komponent (van 40 krag) verminder. ✓✓* (3)

3.2 3.2.1 Mass (of the trolley)/Massa (van die trollie) ✓ (1)

3.2.2  $a \propto F$  ✓✓ (if m constant and net force decreases, the acceleration decreases) **OR** (as net force increases acceleration increases)  
 $a \propto F$  ✓✓ (indien m konstant bly en netto krag afneem, neem die versnelling af) **OF** (as netto krag toeneem sal versnelling toeneem) (2)

3.3 Experiment/Eksperiment **B** ✓

Gradient of **A** > gradient of **B** / Gradiënt van **A** > gradiënt van **B** ✓

$1/m_A > 1/m_B$  ✓✓

Therefore  $m_A < m_B$  / Dus  $m_A < m_B$

(4)

**[21]**

## QUESTION/VRAAG 4

- 4.1 In an isolated system the total linear momentum remains constant. ✓✓  
**(2 of 0)**  
*In 'n geïsoleerde sisteem bly die totale lineêre momentum konstant.* ✓✓  
**(2 of 0)** (2)
- 4.2  $\Sigma p_i = \Sigma p_f$   
 $m_1v_{1i} + m_2v_{2i} = m_1v_{1f} + m_2v_{2f}$  ✓  
 $16\,000 + (2\,000)(10,61)$  ✓ =  $(800)(12) + 2\,000 v_{2f}$  ✓  
 $v_{2f} = 13,81 \text{ m}\cdot\text{s}^{-1}$  ✓ (4)
- 4.3  $E_{k\text{total before/voor}} = \frac{1}{2}mv_A^2 + \frac{1}{2}mv_B^2$   
 $= \frac{1}{2} \times 800 \times 20^2$  ✓ + 112 500  
 $= 272\,500 \text{ J}$
- $E_{k\text{total after/na}} = \frac{1}{2}(800)12^2$  ✓ +  $\frac{1}{2}(2\,000)(13,81)^2$  ✓  
 $= 248\,316,1 \text{ J}$  ✓
- Inelastic:  $E_{k\text{ before}} > E_{k\text{ after}}$  ✓ OR  $E_{k\text{ before}} \neq E_{k\text{ after}}$   
*Onelasties:  $E_{k\text{ voor}} > E_{k\text{ na}}$  ✓ OF  $E_{k\text{ voor}} \neq E_{k\text{ na}}$*  (5)
- 4.4  $F_{\text{net}} \Delta t = \Delta p$  ✓  
 $F_{\text{net}} = (9\,600 - 16\,000 \text{ ✓})/0,15$  ✓  
 $= -42\,666,67 \text{ N}$   
 $= 42\,666,67 \text{ N, left/links}$  ✓ (4)
- [15]

**QUESTION/VRAAG 5**

5.1 Energy a body has because of its position above the ground/  
*Energie wat 'n liggaam het as gevolg van sy posisie bo die grond.* ✓✓ (2)

5.2  $E_k = \frac{1}{2} mv^2$  ✓  
 $= \frac{1}{2} \times 0,5 \times 19,8^2$  ✓  
 $= 98,01 \text{ J}$  ✓ (3)

5.3  $E_p \text{ lost/verloor} = - E_k \text{ gained/bygekry}$   
 $= - 98,01$  ✓✓  
 $98,01 = - mg(y_f - y_i)$   
 $98,01 \checkmark = - 0,5 \times 9,8(y_f - 0)$  ✓  
 $y_f = - 20 \text{ m}$

$E_{\text{mech bottom}} = E_{\text{mech top}}$  ( $E_{\text{meg onder}} = E_{\text{meg bo}}$ )  
 $(mgh + \frac{1}{2}mv^2)_{\text{bottom/onder}} = (mgh + \frac{1}{2}mv^2)_{\text{top/bo}}$  ✓  
 $0 + \frac{1}{2} (0,5 \times 25^2)$  ✓  $= \frac{1}{2} \times 9,8 \times h_P$  ✓  
 $h_P = 31,89 \text{ m}$   
 $h = 31,89 + 20 = 51,89 \text{ m}$  ✓ (8)

5.4  $P = W/\Delta t$  ✓  
 $= 37\,350/20$  ✓  
 $= 1\,867,5 \text{ W}$   
 $P = 1867,5 / 746$  ✓  $= 2,50 \text{ hp}$  ✓ (4)

**[17]**

**QUESTION/VRAAG 6**

- 6.1 Stress/*Druk* ✓ (1)
- 6.2 6.2.1 Strain/*Rekking* =  $\Delta l/L$  ✓ (1)  
=  $(405 - 400) / 400$  ✓  
=  $0,0125$  ✓ (3)
- 6.2.2 Strain/*Rekking* =  $F/A$  ✓  
 $A = \pi r^2$  ✓  
=  $\pi \times (5/1000)^2$  ✓  
=  $7,85 \times 10^{-5} \text{ m}^2$
- Strain/*Rekking* =  $30\,000 / 7,85 \times 10^{-5}$  ✓  
=  $3,82 \times 10^8 \text{ Pa}$  ✓ (5)
- 6.3 6.3.1 Modulus of elasticity/*Elastisiteitsmodulus* ✓ (1)
- 6.3.2 Hooke's law/*Hooke se wet* ✓ (1)
- 6.3.3 Within the limits of elasticity ✓, stress is directly proportional to strain ✓  
*Binne die beperkings van elastisiteit* ✓ *is rekking direk eweredig aan druk.* ✓ (2)
- 6.4 6.4.1 B ✓ (1)
- 6.4.2 A ✓ (1)
- 6.5 6.5.1 Elasticity/*Elastisiteit* ✓ (1)
- 6.5.2 Elastic band, bow, trampoline, spring diving board (Any TWO) ✓✓  
*Elastiese band, boog, trampolien, spring-duikplank (Enige TWEE)* ✓✓ (2)
- 6.5.3 Restoring force/*Herstelkrag* ✓ (1)

**[19]**

**QUESTION/VRAAG 7**

- 7.1 7.1.1 Viscosity is the property of a fluid to oppose relative motion between two adjacent layers. ✓✓  
*Viskositeit is die eienskap van 'n vloeistof om die relatiewe beweging tussen twee aangrensende lae teen te werk.* ✓✓ (2)
- 7.1.2 R ✓  
 Time of flow in R is highest / *Vloeityd is die hoogste in R.* ✓✓ (3)
- 7.1.3 smaller than/*kleiner as* ✓  
 Viscosity increases with increase in temperature. ✓✓  
*Viskositeit neem toe met 'n toename in temperatuur.* ✓✓ (3)
- 7.1.4  $p = \rho gh$  ✓  
 $= 1000 \times 9.8 \times 10$  ✓  
 $= 98\ 00\ \text{Pa}$  ✓ (3)
- 7.2 7.2.1 In a continuous liquid at equilibrium, the pressure applied at a point is transmitted equally to the other parts of the liquid. ✓✓  
*In 'n kontinue vloeistof in ewewig, word die druk wat by enige punt toegepas word eweredig na die ander dele van die vloeistof versprei.* ✓✓ (2)
- 7.2.2  $F_1/A_1 = F_2/A_2$  ✓  
 $F_1/(0,045) = 20\ 000/0,28$  ✓  
 $F_1 = 3\ 214,29\ \text{N}$  ✓ (4)
- [17]**

**QUESTION 8/VRAAG 8**

- 8.1 8.1.1 Communication/*Kommunikasie* ✓ (1)
- 8.1.2 Images of bones ✓/*Security machines at airports etcetera./Beelde van bene* ✓/*Sekuriteitmasjiene by lughawe ensovoorts* (1)
- 8.2 Gamma rays/*Gamma strale* ✓ (1)
- 8.3  $c = f\lambda$  ✓  
 $3 \times 10^8 = 5 \times 10^{17} \lambda$  ✓  
 $\lambda = 6 \times 10^{-9}\ \text{m}$  ✓ (3)
- 8.4  $E = hf$  ✓  
 $= hc/\lambda$   
 $= 6.63 \times 10^{-34} \times 3 \times 10^8 / 502 \times 10^{-9}$  ✓  
 $= 3.96 \times 10^{-19}\ \text{J}$  ✓ (3)
- [9]**



## QUESTION/VRAAG9

9.1 9.1.1 Reflection/Weerkatsing ✓ (1)

9.1.2 Angle of incidence equal to angle of reflection/*Invalshoek gelyk aan weerkatsinghoek* ✓  
 Angle of incidence, angle of reflection and normal are in the same plane/*Invalshoek, weerkatsinghoek en normal is in dieselfde beraming.* (2)

9.1.3 **b** is the angle of reflection ✓ **b** = 60° ✓/  
**b** is die hoek van weerkatsing (2)

9.2 9.2.1 Breaking up of white light into its constituent colours ✓✓/  
*Opbreek van wit lig in sy samestellende kleure* ✓✓ (2)

9.2.2 Red ✓ Highest wavelength ✓ The higher the wavelength the smaller the refraction ✓/  
*Rooi ✓ Hoogste golflengte ✓ Hoe hoër die golflengte, hoe kleiner die ligbreking* (3)

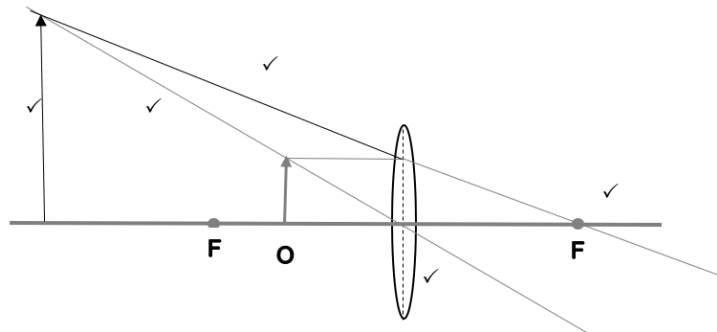
9.3 9.3.1 Refraction ✓/*Ligbreking* (1)

9.3.2 Critical angle ✓/*Kritieke hoek* (1)

9.3.3 Total internal reflection ✓/*Totale interne weerkatsing* (1)

9.3.4 Communications ✓ and medicine ✓/*Kommunikasie en medisyne* (2)

9.4 9.4.1



(5)

9.4.2 Upright ✓/ larger than the object/Virtual (Any one) /  
*Opreg ✓/groter as die voorwerp/Virtueel (Enige een)* (1)

[21]

TOTAL/TOTAAL: 150