



**NATIONAL
SENIOR CERTIFICATE/
NASIONALE SENIOR
SERTIFIKAAT**

GRADE/GRAAD 12

JUNE/JUNIE 2022

**TECHNICAL SCIENCES P1/
TEGNIESE WETENSKAPPE V1
MARKING GUIDE/NASIENRIGLYN**

MARKS/PUNTE: 150

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

QUESTION/VRAAG 1

- 1.1 C ✓✓ (2)
- 1.2 B ✓✓ (2)
- 1.3 B ✓✓ (2)
- 1.4 A ✓✓ (2)
- 1.5 A ✓✓ (2)
- 1.6 A ✓✓ (2)
- 1.7 D ✓✓ (2)
- 1.8 B ✓✓ (2)
- 1.9 A ✓✓ (2)
- 1.10 D ✓✓ (2)
- [20]**

QUESTION/VRAAG 2

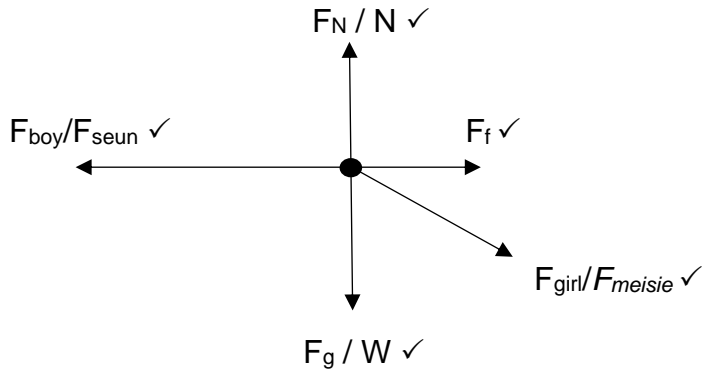
- 2.1 A body will remain in rest or continue moving with a constant velocity unless it is acted upon by a nett force. ✓✓
'n Liggaam sal in rus bly of aanhou beweeg met 'n konstante snelheid tensy 'n netto krag daarop inwerk. ✓✓ (2)
- 2.2 The girl has to overcome inertia. / *Die meisie moet eers traagheid oorkom.* ✓✓
- OR/OF**
- $\mu_s > \mu_k$ ✓✓
- OR/OF**
- $F_s > F_k$ ✓✓ (2)
- 2.3 $F_f = F \cos \theta$ ✓
 $= 100 \cos 42^\circ$ ✓
 $= 74,31 \text{ N}$ ✓ (3)
- 2.4 2.4.1 Decrease / *Afneem* ✓ (1)
- 2.4.2 Decrease / *Afneem* ✓ (1)
- 2.5 $F_f \propto N$ ✓✓
OR/OF Normal force decreases / *Normaalkrag neem af* ✓✓ (2)
- [11]**

QUESTION/VRAAG 3

3.1 3.1.1 acceleration / versnelling ✓

3.1.2 directly proportional / direk eweredig ✓ (2)

3.2



(5)

3.3 3.3.1 $F_v = F \sin \theta$ ✓
 $= 100 \sin 30^\circ$ ✓
 $= 86,6 \text{ N}$ ✓

(3)

3.3.2 **POSITIVE MARKING FROM QUESTION 3.3.1**
POSITIEWE NASIEN VAN VRAAG 3.3.1

$F_f = \mu_k F_N$ ✓
 $= 0,15 \times 86,6$ ✓
 $= 12,99 \text{ N}$ ✓

(3)

3.3.3 $F_H = F \cos \theta$ ✓
 $= 100 \cos 30^\circ$ ✓
 $= 50 \text{ N}$ ✓

(3)

3.4 **POSITIVE MARKING FROM QUESTION 3.3.2 and 3.3.3**
POSITIEWE NASIEN VAN VRAAG 3.3.2 en 3.3.3

$F_{\text{nett}} = ma$ } Any One / Enige een ✓
 $F - F_H - F_f = ma$ } ✓
 $F - 50 - 12,99 = 4(2)$ ✓
 $\therefore F = 70,99 \text{ N}$ ✓

(4)

[20]

QUESTION/VRAAG 4

- 4.1 No net external forces act on the system / (2 or 0). ✓✓
Geen netto eksterne kragte word op die sisteem uitgeoefen nie / (2 of 0). ✓✓ (2)
- 4.2 INELASTIC ✓
 Energy is lost (as sound and heat) **OR** Kinetic energy is not conserved ✓
ONELASTIES ✓
*Energie gaan verlore (as hitte en klank) **OF** Kinetiese energie bly nie behoue nie. ✓* (2)
- 4.3 $E_k = \frac{1}{2}mv^2$ ✓
 $1,216 \times 10^5 \checkmark = \frac{1}{2} (2 \times 10^3 + 1800)v^2 \checkmark$
 $v_{\text{after}} / v_{na} = 8 \text{ m}\cdot\text{s}^{-1} \checkmark$
- $\Sigma p_{\text{after}} = (m_1 + m_2) \cdot v_{\text{after}} \quad \Sigma p_{na} = (m_1 + m_2) \cdot v_{na}$
 $= (2 \times 10^3 + 1800) \times 8 \checkmark$
 $= 30\,400 \text{ kg}\cdot\text{m}\cdot\text{s}^{-1}$
- $\Sigma p_{\text{before}} = \Sigma p_{\text{after}} \quad \Sigma p_{\text{voor}} = \Sigma p_{na}$
 $m_1 v_{\text{before}} = 30\,400$
 $(2 \times 10^3) \cdot v_{\text{before}} = 30\,400 \checkmark$
 $\therefore v_{\text{before}}/v_{na} = 15,2 \text{ m}\cdot\text{s}^{-1} \checkmark$ (7)
- 4.4 The total (linear) momentum of an isolated system remains constant (in both magnitude and direction). ✓✓
Die totale (lineêre) momentum van 'n geïsoleerde sisteem bly konstant (in grootte en rigting). ✓✓ (2)
- 4.5 $F_{\text{nett}} \cdot \Delta t = mv_f - mv_i \checkmark$
 $F_{\text{nett}} (0,1) \checkmark = (2 \times 10^3)(8 - 15,2) \checkmark$
 $\therefore F_{\text{nett}} = \underline{14\,400 \text{ N to the left / na links}} \checkmark$ (4)
- 4.6 Crumple zones increases the time of contact (Δt). ✓ The longer the time of contact the higher the nett force ✓ for the same change in momentum. ✓
Die frommelsones vermeerder die kontaktyd (Δt). / Hoe langer die kontaktyd hoe hoër die netto krag ✓ vir dieselfde verandering in momentum. ✓ (3)

[20]

QUESTION/VRAAG 5

5.1 5.1.1 $W = F \cdot \Delta x \cos \theta \checkmark$
 $= (50)(3,2) \cos 0^\circ \checkmark$
 $= 160 \text{ J} \checkmark$ (3)

5.1.2 **POSITIVE MARKING FROM QUESTION 5.1.1**
POSITIEWE NASIEN VAN VRAAG 5.1.1

$W_f = F_f \Delta x \cos \theta \checkmark$
 $= (2)(3,2) \cos 180^\circ \checkmark$
 $= -6,4 \text{ J} \checkmark$
 $W_{\text{nett}} = 160 + (-6,4) \checkmark$
 $= 153,6 \text{ J} \checkmark$ (4)

5.1.3 $P = Fv \checkmark$
 $= 50 \times 2 \checkmark$
 $= 100 \text{ W}$
 $P = \frac{100}{74,6} \checkmark$
 $= 1,34 \text{ hp} \checkmark$ (4)

5.2.1 Energy of a body due to its position above the ground. $\checkmark\checkmark$
Energie wat 'n liggaam het as gevolg van sy posisie bokant die grond. $\checkmark\checkmark$ (2)

5.2.2 Total mechanical energy of an isolated system remains constant. $\checkmark\checkmark$
Totale meganiese energie van 'n geïsoleerde sisteem bly konstant. $\checkmark\checkmark$ (2)

5.2.3 $E_p = mgh \checkmark$
 $= (0,5)(9,8)(15) \checkmark$
 $= 73,5 \text{ J} \checkmark$ (3)

5.3 E_k at X / E_k by X
 $E_k = \frac{1}{2}mv^2$
 $= \frac{1}{2}(0,5)(14^2) \checkmark$
 $= 49 \text{ J} \checkmark$
 $E_{\text{mechX}} = 2 \times 49 \checkmark$
 $= 98 \text{ J} \checkmark$ (4)

[22]

QUESTION/VRAAG 6

- 6.1 **Deforming force:** A force that changes the shape and size of a body. ✓✓
Restoring force: A force that develops in a body and tries to bring a body back to its original shape and size. ✓✓
Vervormingskrag: Die krag wat die vorm en grootte van 'n liggaam verander. ✓✓
Herstellkrag: 'n Krag wat binne in 'n liggaam ontwikkel en probeer om die liggaam na sy oorspronklike vorm en grootte terug te bring. ✓✓ (4)
- 6.2 6.2.1 **Strain** is the ratio of change in dimension to the original dimension of an object. ✓✓
Rekking is die verhouding tussen die verandering in dimensie en die oorspronklike dimensie van die voorwerp. ✓✓ (2)
- 6.2.2
$$\sigma = \frac{F}{A} \checkmark$$

$$= \frac{F}{\pi r^2}$$

$$= \frac{1925,5}{\pi(80 \times 10^{-3})/2)^2} \checkmark$$

$$= \frac{1925,5}{5,027 \times 10^{-3}}$$

$$= 382\,932,17 \text{ Pa} \checkmark$$
 (3)
- 6.2.3
$$K = \frac{\sigma}{\epsilon}$$

$$190 \times 10^9 = \frac{382\,932,17}{\epsilon} \checkmark$$

$$\therefore \epsilon = 2,01 \times 10^{-6}$$

Any one / Enige een ✓

$$\epsilon = \frac{\Delta l}{L}$$

$$2,01 \times 10^{-6} \checkmark = \frac{\Delta l}{L}$$

$$= \frac{\Delta l}{(250 \times 10^{-3})} \checkmark$$

$$\therefore \Delta l = 5,025 \times 10^{-7} \text{ m} \checkmark$$
 (5)
- 6.3 6.3.1 Hooke's Law / Hooke se wet ✓ (1)
- 6.3.2 Modulus of elasticity / Elastisiteitsmodulus ✓ (1)
- 6.3.3 Elastic limit reached at point P / Elastisiteitsgrens by punt P bereik. ✓✓ (2)
- 6.4 6.4.1 In a continuous fluid of equilibrium, the pressure applied at any point is transmitted equally to other parts of the liquid. ✓✓
In 'n deurlopende vloeistof in ewewig, sal die druk wat by enige punt toegepas word, eweredig na die ander dele van die vloeistof versprei word. ✓✓ (2)
- 6.4.2 10^5 or/of 10 000 Pa (1)

$$6.4.3 \quad \frac{F_1}{A_1} = \frac{F_2}{A_2} \quad \checkmark$$

$$\frac{F_1}{0,03} = \frac{2000 \times 9,8}{0,4} \quad \checkmark$$

$$\therefore F_1 = 1470 \text{ N} \quad \checkmark \quad (3)$$

6.5 Liquid pressure increases as the depth increases. $\checkmark\checkmark$
Vloeistof druk neem toe soos die diepte toeneem. $\checkmark\checkmark$ (2)

6.6 As the temperature increases, the viscosity decreases. }
OR As the temperature decreases, the viscosity increases. } Any one
OR Temperature is inversely proportional to viscosity. } $\checkmark\checkmark$

Soos die temperatuur toeneem, neem die viskositeit af. }
OF *Soos die temperatuur afneem, neem die viskositeit toe.* } Enige
OF *Die temperatuur is omgekeerd eweredig aan viskositeit.* } een
 $\checkmark\checkmark$ (2)

[28]**QUESTION/VRAAG 7**

7.1 The angle of incidence equals the angle of reflection. $\checkmark\checkmark$
Die invalshoek is gelyk aan die weerkaatsingshoek. $\checkmark\checkmark$ (2)

7.2 Upright / Virtual / Same distance from the mirror as the object / Same size as the object. $\checkmark\checkmark$
Regop / Virtueel / Dieselfde afstand vanaf die spieël as die voorwerp / Dieselfde grootte as die voorwerp. $\checkmark\checkmark$ (2)

7.3 7.3.1 Bending of light as it moves from one medium to another where its speed is different.
OR Bending of light when it passes from one medium to another of different optical density. $\checkmark\checkmark$
Buiging van lig soos dit beweeg van een medium na 'n ander, waar die spoed verskillend is.
OF *Buiging van lig soos dit van een medium na 'n ander met verskillende optiese digtheid beweeg.* $\checkmark\checkmark$ (2)

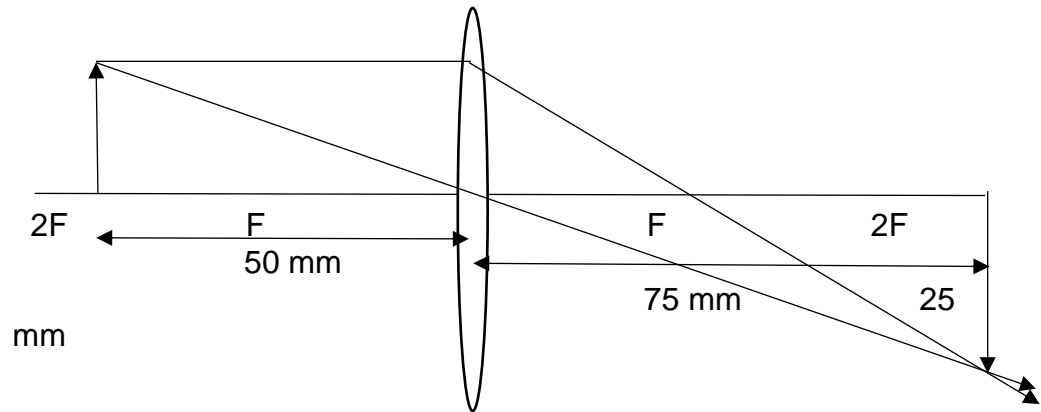
7.3.2 Critical angle / Grenshoek \checkmark (1)

7.3.3 Glass / Glas \checkmark (1)

7.3.4 3 \checkmark
 The angle of incidence is greater than the critical angle. \checkmark
Die invalshoek is groter as die grenshoek. \checkmark (2)

7.3.5 **Any 2 answers / Enige 2 antwoorde:**
 Binoculars / Periscopes / Optical fibres **OR** Any relevant answer. $\checkmark\checkmark$
Verkykers / Periskope / Optiese vesels **OF** *Enige relevante antwoord.* $\checkmark\checkmark$ (2)

7.4 7.4.1



Marking guidelines:	Nasienriglyne:
<ul style="list-style-type: none"> ✓ F and 2F both sides of lens ✓ Object correct height (15 mm) and 50 mm from lens ✓ Lines drawn parallel and through optical centre. ✓ Height of image (25 mm) ✓ Distance of image from optical centre (75 mm) 	<ul style="list-style-type: none"> ✓ F en 2F albei kante van die lens ✓ Voorwerp korrekte hoogte (15 mm) en 50 mm vanaf die lens. ✓ Lyne parallel en deur die optiese middelpunt. ✓ Hoogte van beeld (25 mm) ✓ Afstand van beeld vanaf die optiese middelpunt (75 mm)

(5)

7.4.2 Real / Reël ✓

(1)

[18]

QUESTION/VRAAG 8

- 8.1 Dispersion / *Dispersie* ✓ (1)
- 8.2 8.2.1 Indigo ✓ (1)
- 8.2.2 Ultra-violet (UV) ✓ (1)
- 8.3 X-rays / *X-strale* **Q P** (✓✓ or 0) (2)
- 8.4 8.4.1 A photon is a packet of energy of light
OR A photon is a quantum of energie ✓✓
’n Foton is ’n pakkie ligenergie
OF ’n Foton is ’n kwantum energie. ✓✓ (2)
- 8.4.2 $E = \frac{hc}{\lambda}$ ✓
 $= \frac{(6,3 \times 10^{-34})(3 \times 10^8)}{(1 \times 10^{-8})}$ ✓
 $= 1,89 \times 10^{-17} \text{ J}$ ✓ (4)
- [11]

GRAND TOTAL / GROOTTOTAAL: 150