



**NATIONAL
SENIOR CERTIFICATE/
NATIONALE
SENIOR SERTIFIKAAT**

GRADE/GRAAD 12

JUNE/JUNIE 2025

**TECHNICAL SCIENCES P1/
TEGNIJSE WETENSKAPPE V1
MARKING GUIDELINE/NASIENRIGLYN**

MARKS/PUNTE: 150

This marking guideline consists of 10 pages./
Hierdie nasienriglyn bestaan uit 10 bladsye.

QUESTION/VRAAG 1

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

QUESTION/VRAAG 2

- 2.1 2.1.1 An object continues in a state of rest or uniform velocity ✓ (moving with constant velocity) unless it is acted upon by an unbalanced force. ✓/

*'n Voorwerp gaan voort in 'n toestand van rus of uniforme snelheid ✓
(beweeg met konstante snelheid) tensy 'n ongebalanseerde krag
daarop inwerk. ✓*

OR/OF

An object will remain in its state of rest or continue moving with a constant velocity ✓ unless it is acted on by a resultant force/unbalanced force. ✓/

*'n Voorwerp sal in sy rustoestand bly of met 'n konstante snelheid
aanhou beweeg ✓ tensy dit deur 'n resulterende krag/
ongebalanseerde krag ingewerk word. ✓*

(2)

- 2.1.2 Zero/Nul ✓

OR/OF

0 (m.s⁻¹)

(1)

2.1.3 **OPTION 1/OPSIE 1**

Choose east to be positive/
Kies oos as positief

$$\begin{aligned} F_{\text{net}} &= 0 \\ F_{\text{net}} &= ma \\ F_{\text{net}} &= F_1 + F_2 + F_3 \end{aligned} \quad \left. \begin{array}{l} \\ \\ \end{array} \right\} \checkmark \text{Any ONE/Enige EEN}$$

$$0 = -64 + F_2 + 160 \quad \checkmark$$

$$F_2 = -96 \text{ N}$$

$$F_2 = 96 \text{ N west/wes} \quad \checkmark$$

OPTION 2/OPSIE 2

Choose east to be negative/
Kies oos as negatief

$$\begin{aligned} F_{\text{net}} &= 0 \\ F_{\text{net}} &= ma \\ F_{\text{net}} &= F_1 + F_2 + F_3 \end{aligned} \quad \left. \begin{array}{l} \\ \\ \end{array} \right\} \checkmark \text{Any ONE/Enige EEN}$$

$$0 = 64 + F_2 + (-160) \quad \checkmark$$

$$F_2 = 96 \text{ N west/wes} \quad \checkmark$$

ACCEPT/AANVAAR

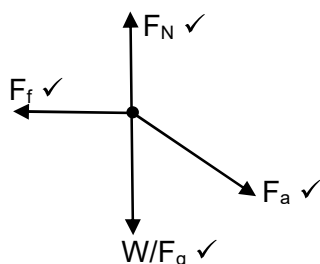
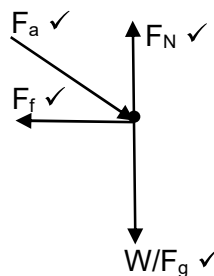
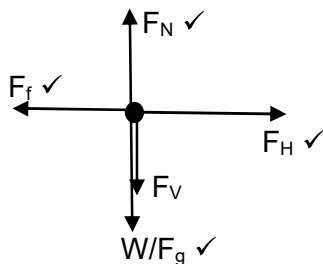
(Maximum: 2 marks/Maksimum: 2 punte)

$$F_2 = F_3 - F_1$$

$$F_2 = 160 - 64 \quad \checkmark$$

$$F_2 = 96 \text{ N west/wes} \quad \checkmark$$

(3)

2.2 2.2.1 **OPTION 1/OPSIE 1****OPTION 2/OPSIE 2****OPTION 3/OPSIE 3**

(3)

NOTES:

One mark for each arrow with correct label

Penalise (once) for each:

- No arrows
- No dot
- Gap between the line and the dot
- Dotted lines are used
- Additional force is included
- A force diagram is given

NOTAS:

Een punt vir elke pyltjie met korrekte byskrif

Penaliseer (eenkeer) vir elk:

- Geen pyltjies
- Geen punt
- Spasie tussen lyn en punt
- Stippellyne word gebruik
- Addisionele kragte is ingesluit
- 'n Kragte diagram is gegee

2.2.2 OPTION 1/OPSIE 1

$$\begin{aligned} F_f &= \mu_k F_N \checkmark \\ &= \mu_k (F_g + F_v) \\ &= 0,24 \checkmark (50 \times 9,8) + (280 \sin 30^\circ) \checkmark \\ &= 151,20 \text{ N } \checkmark \end{aligned}$$

OPTION 2/OPSIE 2

$$\begin{aligned} F_N &= F_g + F_v \\ F_N &= 50 \times 9,8 + 280 \sin 30^\circ \checkmark \\ F_N &= 630 \text{ N} \\ F_f &= \mu_k F_N \checkmark \\ &= 0,24 \times 630 \checkmark \\ &= 151,20 \text{ N } \checkmark \end{aligned} \quad (4)$$

2.2.3 False/Onwaar $\checkmark\checkmark$ (2)

2.2.4 POSITIVE MARKING FROM 2.2.2/ POSITIEWE NASIEN VANAF 2.2.2**OPTION 1/OPSIE 1**

$$\begin{aligned} F_{\text{net}} &= ma \\ F_{\text{net}} &= F_H + F_f \checkmark \text{ Any ONE/Enige EEN} \\ F_H + F_f &= ma \\ \underline{280 \cos 30^\circ + (-151,20)} \checkmark &= 50a \checkmark \\ \therefore a &= 1,83 \text{ m.s}^{-2} \checkmark \end{aligned}$$

OPTION 2/OPSIE 2

$$\begin{aligned} F_{\text{net}} &= F_H + F_f \\ &= 280 \cos 30^\circ + (-151,20) \checkmark \\ &= 91,29 \text{ N} \\ F_{\text{net}} &= ma \checkmark \\ 91,29 &= 50a \checkmark \\ \therefore a &= 1,83 \text{ m.s}^{-2} \checkmark \end{aligned} \quad (4)$$

2.2.5 Decrease/Verminder $\checkmark\checkmark$ (2)

[22]

QUESTION/VRAAG 3

3.1 3.1.1 Momentum is defined as the product of an object's mass and its velocity. $\checkmark\checkmark$ / *Momentum word gedefinieer as die produk van 'n voorwerp se massa en sy snelheid.* (2)

3.1.2 Yes/Ja $\checkmark$ (1)

3.1.3 East as positive/ Oos as positief

$$\begin{aligned} \Sigma p_i &= \Sigma p_f \\ m_1 v_{1i} + m_2 v_{2i} &= m_1 v_{1f} + m_2 v_{2f} \checkmark \text{ Any ONE/ Enige EEN} \\ \underline{(10)(8) + (6)(0)} \checkmark &= \underline{(10)(-0,50) + (6)v_{2f}} \checkmark \\ v_{2f} &= 14,17 \text{ m.s}^{-1} \text{ east / oos } \checkmark \end{aligned} \quad (4)$$

3.1.4 Law of conservation of momentum ✓

Total linear momentum of an isolated system remains constant (is conserved) in magnitude and direction. ✓✓/

Wet van behoud van momentum ✓

Totale lineêre momentum van 'n geïsoleerde stelsel bly konstant (is behoue) in grootte en rigting. ✓✓

(3)

3.2 3.2.1 Impulse is the product of the net force acting on an object ✓ and the time the net force acts on the object. ✓/

Impuls is die produk van die netto krag wat op 'n voorwerp inwerk ✓ en die tyd wat die netto krag op die voorwerp inwerk. ✓

(2)

3.2.2 Directly proportional / Direk eweredig ✓✓

(2)

3.2.3 From impulse-momentum theorem, it follows that the net force exerted on an object is inversely proportional to the contact time. ✓✓

Accept mathematical expression: $F_{\text{net}} \propto \frac{1}{\Delta t}$ /

Uit impuls-momentumstelling volg dit dat die netto krag wat op 'n voorwerp uitgeoefen word inverse eweredig is aan die kontaktyd. ✓✓

Aanvaar wiskundige uitdrukking: : $F_{\text{net}} \propto \frac{1}{\Delta t}$

(2)

3.2.4 **OPTION 1/OPSIE 1**

$$F_{\text{net}}\Delta t = \Delta p$$

$$F_{\text{net}}\Delta t = p_f - p_i \quad \left. \begin{array}{l} \checkmark \text{ Any ONE/Enige EEN} \end{array} \right\}$$

$$F_{\text{net}}\Delta t = m(v_f - v_i)$$

$$F_{\text{net}}(0,007) \checkmark = 0,29(-15,70 - 24,69) \checkmark$$

$$F_{\text{net}} = -1\,673,30 \text{ N}$$

$$F_{\text{net}} = 1\,673,30 \text{ N}$$

Away from the batman /

Weg van die kolwer ✓

OPTION 2/OPSIE 2

$$F_{\text{net}} = \frac{\Delta p}{\Delta t} \quad \left. \begin{array}{l} \checkmark \text{ Any ONE} \end{array} \right\}$$

$$F_{\text{net}} = \frac{m(v_f - v_i)}{\Delta t} \quad \left. \begin{array}{l} \text{Enige EEN} \end{array} \right\}$$

$$F_{\text{net}} = \frac{0,29(15,70 - (-24,69)) \checkmark}{0,007 \checkmark}$$

$$F_{\text{net}} = -1\,673,30 \text{ N}$$

$$F_{\text{net}} = 1\,673,30 \text{ N}$$

Away from the batman /

Weg van die kolwer ✓

(4)

3.2.5 **Positive marking from 3.2.4/Positiewe nasien vanaf 3.2.4**

1 673,30 N ✓ towards the batsman / na die kolwer ✓

(2)

3.2.6 Newton's Third Law of motion. ✓

When object A exerts a force on object B, object B simultaneously exerts an oppositely directed force of equal magnitude on object A. ✓✓/

Newton se Derde bewegingswet. ✓

Wanneer voorwerp A 'n krag op voorwerp B uitoefen, oefen voorwerp B gelyktydig 'n teenoorgestelde gerigte krag van gelyke grootte op voorwerp A uit. ✓✓

(3)

[25]

QUESTION/VRAAG 4

- 4.1 4.1.1 Kinetic energy is the energy of an object due to its motion. ✓✓/
Kinetiese energie is die energie van 'n voorwerp as gevolg van sy beweging. (2)

- 4.1.2 The total mechanical energy (sum of gravitational potential energy and kinetic energy) in an isolated system ✓ remains constant. ✓
Die totale meganiese energie (som van gravitasie potensiele energie en kinetiese energie) in 'n geïsoleerde sisteem ✓ bly konstant. ✓ (2)

- 4.1.3 $(E_m)_{\text{top}} = E_p + E_k$
 $ME = E_p + E_k$
 $ME = mgh + \frac{1}{2}mv^2$ } ✓ Any ONE/ Enige EEN
 $ME = (5)(9,8)(4) + \frac{1}{2}(5)(0)^2$ ✓
 $ME = 196 \text{ J}$ ✓ (3)

- | | |
|--|--|
| <p>4.1.4 POSITIVE MARKING FROM Q4.1.3/ POSITIEWE NASIEN VANAF V4.1.3
 OPTION 1/ OPSIE 1
 $(ME)_{2m} = (ME)_{\text{top}}$
 $(E_p + E_k)_{2m} = (ME)_{\text{top}}$ } ✓ Any ONE/ Enige EEN
 $(5)(9,8)(2) + E_k = 196 \text{ J}$ ✓
 $E_k = 98 \text{ J}$
 $\frac{1}{2}mv^2 = 98$
 $\frac{1}{2}(5)v^2 = 98$ ✓
 $v = 6,26 \text{ m.s}^{-1}$ ✓</p> | <p>POSITIVE MARKING FROM Q4.1.3/POSITIEWE NASIEN VANAF V4.1.3
 OPTION 2/ OPSIE 2
 $(ME)_{2m} = (ME)_{\text{top}}$
 $(E_p + E_k)_{2m} = (ME)_{\text{top}}$ } ✓ Any ONE/ Enige EEN
 $(5)(9,8)(2) + \frac{1}{2}(5)v^2 = 196$ ✓
 $98 + 2,5 v^2 = 196$
 $v^2 = 39,2$
 $v = 6,26 \text{ m.s}^{-1}$ ✓</p> |
|--|--|
- (4)

- 4.1.5 **POSITIVE MARKING FROM Q4.1.3/ POSITIEWE NASIEN VANAF V4.1.3**
 $E_k = 196 \text{ J}$

The system is isolated. ✓ The kinetic energy at the bottom is equal to the gravitational potential energy at the top. ✓/

Die stelsel is geïsoleer. ✓ Die kinetiese energie aan die onderkant is gelyk aan die gravitasie potensiele energie aan die bokant. ✓

OR/OF

The mechanical energy is conserved ✓ because the system is isolated. ✓

Die meganiese energie is behoue ✓ omdat die sisteem geïsoleerd is. ✓ (3)

- 4.2 4.2.1 Work done is the product of the force applied on an object and the displacement ✓ in the direction of the force. ✓/
Arbeid verrig is die produk van die krag wat op 'n voorwerp toegepas word en die verplasing ✓ in die rigting van die krag. ✓ (2)

4.2.2 $W_f = F_f \Delta x \cos \theta$ ✓
 $W_f = (20)(4,5) \cos 180^\circ$ ✓
 $W_f = -90 \text{ J}$ ✓ (3)

4.2.3 0 J ✓✓ (2)

4.2.4 **OPTION 1/OPSIE 1**

$W_{\text{net}} = F_{\text{net}} \Delta x \cos \theta$ ✓
 $W_{\text{net}} = (100 - 20) (4,5) \cos 0^\circ$ ✓
 $W_{\text{net}} = 360 \text{ J}$ ✓

OPTION 2/ OPSIE 2

**POSITIVE MARKING FROM Q4.2.2/
 POSITIEWE NASIEN VANAF V4.2.2**

$W_{\text{net}} = W_f + W_F$ ✓
 $W_{\text{net}} = F_f \Delta x \cos 180^\circ + F_a \Delta x \cos 0^\circ$
 $W_{\text{net}} = (20)(4,5)(-1) + (100)(4,5)(1)$ ✓
 $W_{\text{net}} = 360 \text{ J}$ ✓ (4)

[25]

QUESTION/VRAAG 5

5.1 A body which regains its original shape and size completely when the deforming force is removed. ✓✓/
'n Liggaam wat sy oorspronklike vorm en grootte heeltemal herwin wanneer die vervormende krag verwyder word. ✓✓ (2)

5.2 The internal restoring force per unit area is called stress. ✓✓/
Die interne herstelkrag per oppervlakte-eenheid word spanning genoem. ✓✓ (2)

5.3 5.3.1 Stress is directly proportional to strain. ✓✓/
Druk is direk eweredig aan spanning. ✓✓ (2)

5.3.2 Hooke's law/ Hooke se wet ✓ (1)

5.3.3 Substance **A/ Stof A**

$$m_A = \frac{5,4 \times 10^9 - 0}{3 \times 10^{-2} - 0} \quad \checkmark$$

$$m_A = 1,80 \times 10^{11} \text{ Pa} \quad \checkmark$$

Substance **B/ Stof B**

$$m_B = \frac{10,44 \times 10^9 - 0}{3 \times 10^{-2} - 0} \quad \checkmark$$

$$m_B = 3,48 \times 10^{11} \text{ Pa} \quad \checkmark$$

Substance **B** has the highest modulus of elasticity. ✓/
Stof B het die hoogste elastisiteits-modulus. (5)

5.4 5.4.1 The property of a fluid to oppose relative motion between the two adjacent layers. ✓✓/
Die eienskap van 'n vloeistof om relatiewe beweging tussen die twee aangrensende lae teen te werk. ✓✓ (2)

5.4.2 Vinegar ✓
 The lower the viscosity, the faster the flow. ✓/
Asyn ✓
Hoe laer die viskositeit, hoe vinniger die vloei. ✓ (2)

5.4.3 As the temperature of the fluid increases, its viscosity decreases. ✓✓/
Soos die temperatuur van die vloeistof toeneem, neem die viskositeit daarvan af. ✓✓ (2)

5.5 5.5.1 Pascal's law states that in a continuous liquid at equilibrium, the pressure applied at a point is transmitted equally to the other parts of the liquid. ✓✓/
Pascal se wet bepaal dat in 'n kontinue vloeistof by ewewig is, die druk wat by 'n punt toegepas word, eweredig na die ander dele van die vloeistof oorgedra word. ✓✓ (2)

5.5.2 $\frac{F_1}{A_1} = \frac{F_2}{A_2}$ ✓
 $\frac{882,5}{142 \times 10^{-6}} \checkmark = \frac{F_2}{253,5 \times 10^{-6}} \checkmark$
 $F_2 = 1\,575,45 \text{ N}$ ✓ (4)

5.5.3 INCREASES/VERMEERDER ✓ (1)

- 5.5.4
- Bulldozer's working system/*Stootskraper se werkstelsel*
 - Dentist chair/*Tandartsstoel*
 - Hydraulic lifts used to lift heavy loads/*Hidrouliese hysbakke wat gebruik word om swaar vragte op te lig*
 - Car jacks/*Motoromkragte* ✓✓ (Any TWO/Enige TWEE) (2)
- [27]

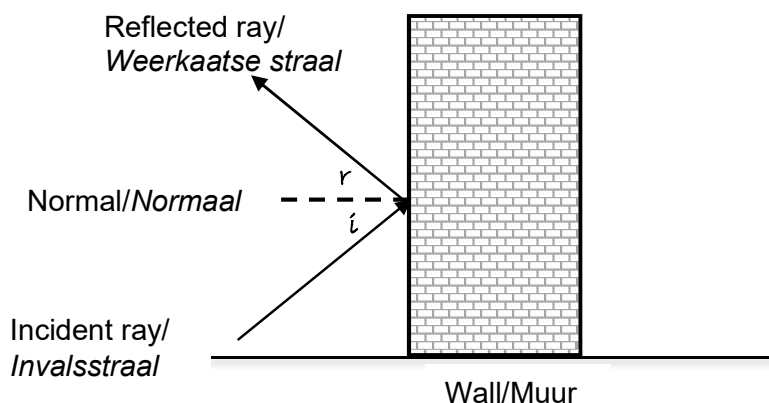
QUESTION/VRAAG 6

- 6.1 The change in direction of a wave upon striking the interface between two materials. ✓✓/

Die verandering in rigting van 'n golf wanneer dit die raakvlak tussen twee materiale tref.

(2)

6.2



Criteria for marking diagram/ <i>Kriteria vir die nasien van diagram</i>	Marks/ <i>Punte</i>
• Angle of reflection correctly indicated / <i>Hoek van weerkaatsing korrek aangedui</i>	✓
• Reflected ray correctly drawn / <i>Weerkaatse straal korrek geteken</i>	✓
• Incident ray, normal and reflected ray meet at the same wall / <i>Invallende straal, normale en weerkaatse straal ontmoet by dieselfde muur</i>	✓

(3)

- 6.3 6.3.1 The ratio of speed of light in a vacuum to the speed of light in the medium. ✓✓/
Die verhouding van spoed van lig in 'n vakuum tot die spoed van lig in die medium. ✓✓

(2)

- 6.3.2 Medium A ✓✓

(2)

- 6.3.3 FALSE. ✓ It has the lowest refractive index, meaning less optical dense. ✓✓/
ONWAAR. Dit het die laagste brekingsindeks, d.w.s minder opties dig.

(3)

- 6.3.4 Towards the normal. ✓
 Speed of light in medium C is faster than the speed of light in medium D. ✓
 The refractive index of medium C is higher than medium D. ✓
Na die normale. ✓
Spoed van lig in medium C is vinniger as die spoed van lig in medium D. ✓
Die brekingsindeks van medium C is hoër as medium D. ✓

OR/OF

Light is moving from optically less dense to optically denser medium.
Lig beweeg van opties minder dig na opties digter medium.

(3)

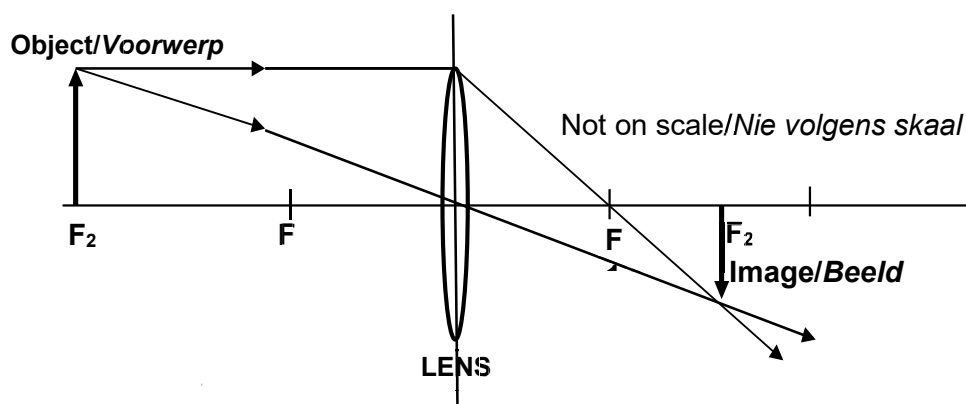
[15]

QUESTION/VRAAG 7

- 7.1 7.1.1 When an object is placed between the focus and optical centre. ✓✓/
 Wanneer 'n voorwerp tussen die fokus en optiese middelpunt geplaas word. ✓✓

(2)

7.1.2



Criteria for Marking Diagram/ Kriteria vir Nasiendiagram	Marks/ Punte
• Lens with centre line/Lens met middellyn.	✓
• 2F or F ₂ on respective sides of the lens. /2F of F ₂ op onderskeie kante van die lens	✓
• Principal axis with the position of the focal point F on both sides of the lens at equal distance from optical centre. / Hoof-as met die posisie van die fokuspunt F aan beide kante van die lens op gelyke afstand van optiese middelpunt.	✓✓
• Parallel incident ray to the principal axis refracts and goes through to the focal point. /Parallele invallende straal met die hoof-as breek en gaan deur na die fokuspunt.	✓✓
• The ray passes through to the optical centre of the lens without being refracted. /Die straal gaan deur na die optiese middelpunt van die lens sonder om gebreek te word.	✓✓

(8)

- 7.1.3 Position of the image = 28–30 mm from lens (further than 2F) ✓
 Size of the image = 10–12 mm high ✓
 Nature of the image = real, inverted and enlarged. ✓ (Any one) /
 Posisie van die beeld = 28–30 mm vanaf lens (verder as 2F) ✓
 Grootte van die beeld = 10–12 mm hoog ✓
 Aard van die beeld = werklik, omgekeerd en vergroot. ✓ (Enige een)

(3)

- 7.2
- Magnifying glasses/Vergrootglase
 - Microscope/Mikroskoop
 - Cameras/Kameras
 - Telescopes/Teleskope
 - Projectors/Projektors
 - Binoculars/Verkykers

✓✓✓ (Any THREE/Enige DRIE)

(3)

[16]

TOTAL/TOTAAL: 150