



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**SENIOR CERTIFICATE EXAMINATIONS/
NATIONAL SENIOR CERTIFICATE EXAMINATIONS/
SENIORSERTIFIKAAT-EKSAMEN/
NASIONALE SENIORSERTIFIKAAT-EKSAMEN**

TECHNICAL SCIENCES P1/TEGNIJSE WETENSKAPPE V1

MAY/JUNE/MEI/JUNIE 2025

MARKING GUIDELINES/NASIERIGLYNE

MARKS/PUNTE: 150

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

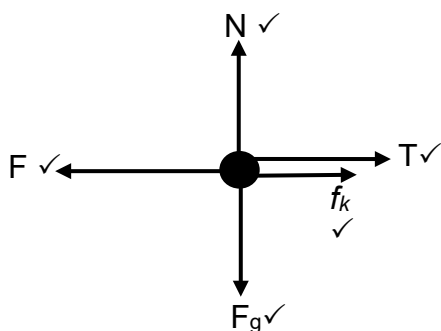
QUESTION/VRAAG 1

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

QUESTION/VRAAG 2

- 2.1 When a net/resultant force is applied to an object of mass, m , it accelerates the object in the direction of the net force.✓✓ The acceleration is directly proportional to the net/resultant force and inversely proportional to the mass of the object./Wanneer 'n resulterende/netto krag op 'n voorwerp met massa, m , inwerk, versnel die voorwerp in die rigting van die netto krag. Die versnelling is direk eweredig aan die resulterende/netto krag en omgekeerd eweredig aan die massa van die voorwerp. (2)

2.2



ACCEPTABLE LABELS/ AANVAARBARE BYSKRIFTE

N/ F_N : Normal/Normaal
 F_g / W : Force due to gravity/weight/
 Krag as gevolg van
 gravitasie/gewig
 T/ F_T : Tension/Spansing
 f_k / F_f /4,5 N: kinetic friction/
 frictional force/kinetiese wrywing/
 wrywingskrag
 F/ F_A : Applied force/Toegepaste
 krag

NOTES/NOTAS:

One mark for each force represented by an arrow with a correct label./Een punt vir elke krag verteenwoordig deur 'n pyl met korrekte byskrif.
 Penalise ONCE for each of the following/Penaliseer EEN KEER vir elk van die volgende:

- No arrows/Geen pyle
- There is no dot/Daar is geen punt
- Gap between the line and dot/Gaping tussen die lyn en punt
- Dotted lines are used/Gebroke lyne word gebruik
- A force diagram is drawn/'n Kragtediagram is geteken
- Any additional forces added/Enige addisionele kragte bygevoeg

(5)

2.3.1

OPTION/OPSIE 1 (LEFT IS POSITIVE/LINKS IS POSITIEF)	OPTION/OPSIE 2 (LEFT IS NEGATIVE/LINKS IS NEGATIEF)
$F_{\text{net/netto}} = ma$ $T + (-f_k) = ma$ ✓ (any one/ enige een) $T + (-3,5) = (2)(1,5)$ ✓ $T = 6,5 \text{ N (left/links)}$ ✓	$F_{\text{net/netto}} = ma$ $-T + f_k = ma$ ✓ (any one/ enige een) $-T + 3,5 = (2)(-1,5)$ ✓ $T = -6,5 \text{ N}$ $T = 6,5 \text{ N (left/links)}$ ✓

(3)

2.3.2 POSITIVE MARKING FROM QUESTION 2.3.1/POSITIEWE NASIEN VANAF VRAAG 2.3.1

OPTION/OPSIE 1 (LEFT IS POSITIVE/LINKS IS POSITIEF)	OPTION/OPSIE 2 (LEFT IS NEGATIVE/LINKS IS NEGATIEF)
$F_{\text{net/netto}} = ma$ $F + (-f_k) + (-T) = ma$ ✓ (any one/ enige een) $F + (-4,5) + (-6,5) = (4)(1,5)$ ✓ $F = 17 \text{ N (left/links)}$ ✓	$F_{\text{net/netto}} = ma$ $-F + f_k + T = ma$ ✓ (any one/ enige een) $-F + 6,5 + 4,5 = (4)(-1,5)$ ✓ $F = -17 \text{ N}$ $F = 17 \text{ N (left/links)}$ ✓

(4)

2.4.1

OPTION/OPSIE 1	OPTION/OPSIE 2
$30 \text{ km}\cdot\text{h}^{-1} = \frac{30 \times 1\,000}{60 \times 60} \checkmark$ $= 8,33 \text{ m}\cdot\text{s}^{-1} \checkmark$	$30 \text{ km}\cdot\text{h}^{-1} = \frac{30}{3,6} \checkmark$ $= 8,33 \text{ m}\cdot\text{s}^{-1} \checkmark$

(2)

2.4.2

The boy will continue moving to the right/forward ✓ at $30 \text{ km}\cdot\text{h}^{-1}$ /same velocity ✓ due to inertia./Die seun sal voortgaan om na regs/vorentoe te beweeg teen $30 \text{ km}\cdot\text{h}^{-1}$ /dieselfde snelheid as gevolg van traagheid.

(2)

2.4.3

Inertia ✓

The property of a body to resist any change in its state of motion or rest. ✓ ✓
/Die eienskap van 'n liggaam in 'n toestand van rus of beweging, wat enige beweging, verandering in beweging teenstaan.

(3)

[21]

QUESTION/VRAAG 3

3.1

The total linear momentum of an isolated system ✓ remains constant/is conserved in magnitude and direction. ✓ /Die totale lineêre momentum van 'n geïsoleerde sisteem bly konstant (word behou) in grootte en rigting.

(2)

3.2.1

OPTION/OPSIE 1 (EAST IS POSITIVE/OOS AS POSITIEF)
$\sum p_i = \sum p_f$ $p_{i(X)} + p_{i(Y)} = p_{f(XY)} \checkmark$ (any one/enige een) $m_{i(X)} v_{i(X)} + m_{i(Y)} v_{i(Y)} = (m_{f(X)} + m_{f(Y)}) v_f$ $(1\,500) \checkmark (30) \checkmark + (1\,000)(0) = (1\,500 + 800 + 200)(v_f) \checkmark$ $v_f = 18 \text{ m}\cdot\text{s}^{-1} \text{ east/oos} \checkmark$

OPTION/OPSIE 2 (EAST IS NEGATIVE/OOS AS NEGATIEF)
$\sum p_i = \sum p_f$ $p_{i(X)} + p_{i(Y)} = p_{f(XY)} \checkmark$ (any one/enige een) $m_{i(X)} v_{i(X)} + m_{i(Y)} v_{i(Y)} = (m_{f(X)} + m_{f(Y)}) v_f$ $(1\,500) \checkmark (-30) \checkmark + (1\,000)(0) = (1\,500 + 800 + 200)(v_f) \checkmark$ $v_f = -18 \text{ m}\cdot\text{s}^{-1}$ $v_f = 18 \text{ m}\cdot\text{s}^{-1} \text{ east/oos} \checkmark$

(5)

3.2.2

POSITIVE MARKING FROM QUESTION 3.2.1/POSITIEWE NASIEN VANAF VRAAG 3.2.1

OPTION/OPSIE 1: FORCE of Y on X/KRAG van Y op X
$F_{\text{net/netto}} \Delta t = \Delta p$ $F_{\text{net/netto}} \Delta t = mv_f - mv_i$ } (any one/enige een) $(F_{\text{net/netto}}) (0,2) \checkmark = 1\,000(18 - 0) \checkmark$ $F_{\text{net/netto}} = 90\,000 \text{ N} \checkmark$

OPTION/OPSIE 2: FORCE of X on Y/KRAG van X op Y
$F_{\text{net/netto}} \Delta t = \Delta p$ $F_{\text{net/netto}} \Delta t = mv_f - mv_i$ } (any one/enige een) $(F_{\text{net/netto}}) (0,2) \checkmark = 1\,500(18 - 30) \checkmark$ $F_{\text{net/netto}} = -90\,000 \text{ N}$ $F_{\text{net/netto}} = 90\,000 \text{ N} \checkmark$

OPTION/OPSIE 3: FORCE of X on Y/KRAG van X op Y

$$\begin{aligned} F_{\text{net/netto}} &= ma \checkmark \\ &= 1500 \frac{(18 - 30)}{0,2} \checkmark \\ &= -90\,000 \text{ N} \\ &= 90\,000 \text{ N} \checkmark \end{aligned}$$

(4)

- 3.3 The air bubbles will increase the time of contact \checkmark and thus decrease the net force. \checkmark This will minimise the damage to the sound equipment. \checkmark / Die lugborrels sal die tyd van impak verleng en dus verminder die netto krag. Dit sal die skade aan die klanktoerusting verminder.

(3)
[14]

QUESTION/VRAAG 4

- 4.1 Sum of the gravitational potential energy and the kinetic energy. $\checkmark\checkmark$ / Som van die gravitasie-potensiële energie en kinetiese energie.

(2)

4.2.1
$$\begin{aligned} M_E &= E_P + E_K \\ &= mgh + \frac{1}{2}mv^2 \end{aligned} \left. \vphantom{\begin{aligned} M_E &= E_P + E_K \\ &= mgh + \frac{1}{2}mv^2 \end{aligned}} \right\} \checkmark \text{ (any one/enige een)}$$

$$= (5,5 \times 10^{11}) \checkmark (9,8)(202) \checkmark + \frac{1}{2} (5,5 \times 10^{11})(0)^2$$

$$= 1,08878 \times 10^{15} \text{ J} \checkmark / 1,09 \times 10^{15} \text{ J}$$

(4)

- 4.2.2 **POSITIVE MARKING FROM QUESTION 4.2.1/POSITIEWE NASIEN VANAF VRAAG 4.2.1**

$$\begin{aligned} (E_P + E_K)_A &= (E_P + E_K)_B \\ (mgh + \frac{1}{2}mv^2)_A &= (mgh + \frac{1}{2}mv^2)_B \end{aligned} \left. \vphantom{\begin{aligned} (E_P + E_K)_A &= (E_P + E_K)_B \\ (mgh + \frac{1}{2}mv^2)_A &= (mgh + \frac{1}{2}mv^2)_B \end{aligned}} \right\} \checkmark \text{ (any one/enige een)}$$

$$1,08878 \times 10^{15} \checkmark = (5,5 \times 10^{11})(9,8)(10) \checkmark + \frac{1}{2} (5,5 \times 10^{11})(v)^2 \checkmark$$

$$v = 61,3449 \text{ m}\cdot\text{s}^{-1} \checkmark / 61,38 \text{ m}\cdot\text{s}^{-1}$$

(5)

- 4.3

OPTION/OPSIE 1:

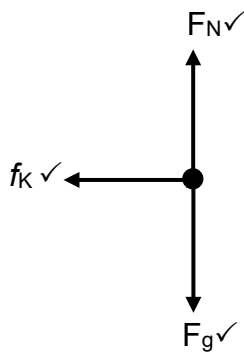
$$\begin{aligned} P_{\text{ave}} &= Fv_{\text{ave/gemid}} \checkmark \\ &= (5,39 \times 10^{12}) \checkmark (192/120) \checkmark \\ &= 8,62 \times 10^{12} \text{ W} \checkmark \end{aligned}$$

OPTION/OPSIE 2:

$$\begin{aligned} P &= \frac{F_x \cos \Theta}{\Delta t} \checkmark \\ &= \frac{(5,39 \times 10^{12}) \checkmark (192) \checkmark (\cos 0^\circ)}{2 \times 60 \checkmark} \\ &= 8,62 \times 10^{12} \text{ W} \checkmark \end{aligned}$$

(4)

4.4.1



**ACCEPTABLE LABELS/
AANVAARBARE BYSKRIFTE**

N/F_N : Normal/Normaal
 F_g/w : Force due to gravity/weight/ Krag as gevolg van gravitasie/gewig
 $f/f_k/F_f$: kinetic friction/ frictional force/kinetiese wrywing/wrywingskrag

NOTES/NOTAS:

One mark for each force represented by an arrow with a correct label./Een punt vir elke krag verteenwoordig deur 'n pyl met korrekte byskrif.

Penalise ONCE for each of the following/Penaliseer EEN KEER vir elk van die volgende:

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- Dotted lines are used/Gebroke lyne word gebruik
- A force diagram is drawn/'n Kragtediagram is geteken
- Any additional forces added/Enige addisionele kragte bygevoeg

(3)

4.4.2 $W = F \Delta x \cos \theta$ ✓
 $= (4,27 \times 10^2) (2)(\cos 180^\circ)$ ✓
 $= -854 \text{ J}$ ✓

(4)

[22]

QUESTION/VRAAG 5

- 5.1 A body that does not show a tendency to regain its original shape and size when the deforming force is removed. ✓✓/In Liggaam wat nie 'n neiging toon om sy oorspronklike grootte en vorm te verkry wanneer die vervormingskrag verwyder word nie. (2)

- 5.2 Chewing gum✓ /Kougom
Putty✓ /Stopverf
Clay✓ /Klei
Dough/Deeg (any CORRECT three/enige KORREKTE drie) (3)

OPTION/OPSIE 1	OPTION/OPSIE 2
$A = \pi r^2$ $= (\pi) (2 \times 10^{-3})^2 \checkmark$ $= 1,26 \times 10^{-5} \text{ m}^2$ $\sigma = \frac{F}{A} \checkmark$ $= \frac{10 \checkmark}{1,26 \times 10^{-5} \checkmark}$ $= 793\,650,79 \text{ Pa} \checkmark$	$A = \frac{\pi D^2}{4}$ $= \frac{(\pi)(4 \times 10^{-3})^2 \checkmark}{4}$ $= 1,25663706 \times 10^{-5} \text{ m}^2$ $\sigma = \frac{F}{A} \checkmark$ $= \frac{10 \checkmark}{1,25663706 \times 10^{-5} \checkmark}$ $= 795\,774,72 \text{ Pa} \checkmark$
RANGE/REEKS: 793 650,79 Pa – 795 774,72 Pa	

OPTION/OPSIE 3	OPTION/OPSIE 4
$\sigma = \frac{F}{A} \checkmark$ $= \frac{10 \checkmark}{(\pi)(2 \times 10^{-3})^2 \checkmark \checkmark}$ $= 793\,650,79 \text{ Pa} \checkmark$	$\sigma = \frac{F}{A} \checkmark$ $= \frac{10 \checkmark}{\frac{(\pi)(4 \times 10^{-3})^2}{4} \checkmark \checkmark}$ $= 793\,650,79 \text{ Pa} \checkmark$
RANGE/REEKS: 793 650,79 Pa – 795 774,72 Pa	

- 5.4 Is a field in applied sciences and engineering dealing with mechanical properties of liquids. ✓✓/Is 'n veld in toegepaste wetenskappe en ingenieurswese wat die meganiese eienskappe van vloeistowwe behels. (2)
- 5.5
- Must be a continuous liquid ✓/Moet 'n kontinue vloeistof wees.
 - Liquid must be at equilibrium or at rest ✓/Vloeistof moet by ewewig of in rus wees (2)

5.6

OPTION/OPSIE 1

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

$$\left[\frac{F_1}{(\pi)(0,015)^2} \right] \checkmark = \left[\frac{5\,100}{(\pi)(0,04)^2} \right] \checkmark$$

$$F_1 = 717,1875 \text{ N } \checkmark$$

OPTION/OPSIE 2

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

$$\left[\frac{F_1}{(\pi)(\frac{30 \times 10^{-3}}{4})^2} \right] \checkmark = \left[\frac{5\,100}{(\pi)(\frac{80 \times 10^{-3}}{4})^2} \right] \checkmark$$

$$F_1 = 717,1875 \text{ N } \checkmark$$

OPTION/OPSIE 3

$$P_A = \frac{F_A}{A_A}$$

$$= \frac{5100}{(\pi)(40 \times 10^{-3})^2} \checkmark$$

$$= 1014612,762 \text{ Pa}$$

$$P_A = P_B$$

$$P_A = \frac{F_B}{A_B} \checkmark$$

$$1014612,762 = \frac{F_B}{(\pi)(15 \times 10^{-3})^2} \checkmark$$

$$F_B = 717,1875 \text{ N } \checkmark$$

(4)

5.7.1 The property of a fluid to oppose relative motion between the two adjacent layers. ✓✓ *Die eienskap van die vloeistof om relatiewe beweging tussen die twee aangrensende vlakke te opponeer.*

(2)

5.7.2 The oil has a viscosity of 20 SAE in winter/at 0 °C ✓and 50 SAE in summer/at 100 °C. ✓/ *Die olie het 'n viskositeit van 20 SAE in die winter/by 0 °C en 50 SAE in die somer/by 100 °C.*

(2)

5.7.3 Lower the temperature ✓✓/ *Verlaag die temperatuur*

(2)

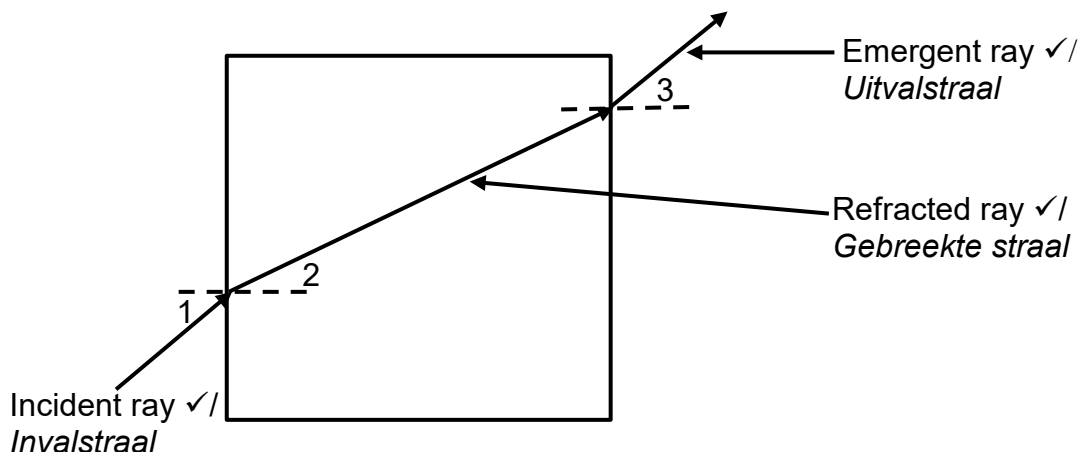
[24]

QUESTION/VRAAG 6

- 6.1 The distance between the focal point and the optical centre/centre of the lens ✓✓/Die afstand tussen die fokuspunt/brandpunt (f) en die optiese middelpunt/middel van die lens. (2)
- 6.2 Convex lenses ✓/Konvekse lense (1)
- 6.3 The lens is thicker in the middle but thinner at the edges. ✓ /Die lens is dikker in die middel, maar dunner op die kante. (1)

OR/OF

- The lens converges the light rays./Die lense konvergeer die ligstrale. (1)
- 6.4 Far sightedness ✓/Hyperopia/Hypermotropia/
Versiendheid/Hiperopie/Verblik (1)
- 6.5.1 The bending of light ✓ when it passes from one medium to another (of different optical densities). ✓/Die buiging van lig wanneer dit van een medium na 'n ander beweeg (met verskillende optiese digtheid). (2)
- 6.5.2



MARKING CRITERIA		
	Name of angle/Naam van hoek	Magnitude/Grootte
1	Angle of incidence ✓/Invalshoek	28°
2	Angle of refraction ✓/Brekingshoek	✓
3	Angle of emergence ✓/Uitvalshoek	28°

(7)
[14]

QUESTION/VRAAG 7

- 7.1 Transverse ✓/Transversale (1)
- 7.2 Radio wave ✓/Microwave / Radiogolwe/Mikrogolwe (1)
- 7.3 A radio wave/microwave has a longer wavelength ✓ and can be transmitted over long distances. ✓ /'n Radiogolf/mikrogolf het 'n langer golflengte en kan oor ver afstande oorgedra word. (2)
- 7.4 $c = f \times \lambda$ ✓
 $3 \times 10^8 \text{ ✓} = (f) (400 \times 10^{-9}) \text{ ✓}$
 $f = 7,5 \times 10^{14} \text{ Hz}$
 $= 7,5 \times 10^{11} \text{ kHz ✓}$ (4)
[8]

QUESTION/VRAAG 8


- 8.1 Acts as an insulator ✓/Dien as 'n insulator (1)
- 8.2 $C = \frac{\epsilon_0 A}{d}$ ✓
 $100 \times 10^{-6} \text{ ✓} = \frac{(8,85 \times 10^{-12})(500 \times 10^{-4})}{d} \text{ ✓}$
 $d = 4,43 \times 10^{-9} \text{ m ✓}$ (4)
- 8.3.1 The LED will shine a red light (for some time until it stops). ✓/Die LED sal 'n rooi lig skyn (vir 'n tyd lank totdat dit ophou). (1)
- 8.3.2 The capacitor will provide electrical energy✓✓ (until it discharges completely). Die kapasitor sal elektriese energie voorsien (totdat dit volkome ontlai het). (2)
- 8.4
- Filter circuits in power supplies ✓ /Filter-stroombane in kragvoorsieners
 - Separation of frequencies between the woofer speaker and tweeter speaker/Skeiding van frekwensies tussen die laebasluidspreker en diskant-trilling/hoë-trilling ('tweeter') luidspreker
 - Power factor correction/Drywingsfaktorregstelling
(any CORRECT one/enige KORREKTE een) (1)
- [9]

QUESTION/VRAAG 9

9.1 In parallel (with the battery) ✓ /In parallel (met die battery) (1)

9.2	OPTION/OPSIE 1	OPTION/OPSIE 2	
	$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} \checkmark$ $\frac{1}{R_p} = \frac{1}{3} + \frac{1}{2} \checkmark$ $R_p = 1,2 \Omega$ $R_T = R_p + 4$ $R_T = 1,2 + 4 \checkmark$ $= 5,2 \Omega \checkmark$	$R_p = \frac{R_1 \times R_2}{R_1 + R_2} \checkmark$ $R_p = \frac{3 \times 2}{3 + 2} \checkmark$ $R_p = 1,2 \Omega$ $R_T = R_p + 4$ $R_T = 1,2 + 4 \checkmark$ $= 5,2 \Omega \checkmark$	(4)

9.3 Decreases ✓ /Afname (1)

9.4  The total resistance increases ✓ /Die totale weerstand neem toe (2)
 • All resistors are connected in series ✓ /Alle resistors is in serie geskakel [8]

QUESTION/VRAAG 10

10.1 AC ✓ /WS (1)

10.2.1 Slip rings ✓ /Sleepringe (1)

10.2.2 (Carbon) brushes ✓ / (Koolstof) borsels (1)

10.3 • Add more turns around the coil ✓ /Voeg meer windings rondom die spoel (1)
 • Use stronger magnets /Gebruik sterker magnete
 • Increase the area of the coil /Vergroot die area van die spoel (any CORRECT one/enige KORREKTE een)

10.4.1 The number of (magnetic) field lines that are perpendicular to the given surface. ✓✓ /Die aantal (magnetiese) veldlyne loodreg op die gegewe oppervlak. (2)

10.4.2 $\Phi = BA \checkmark$
 $= (4) \checkmark (2 \times 10^{-4}) \checkmark$
 $= 8 \times 10^{-4} \text{ Wb} \checkmark$ (4)
[10]

TOTAL/TOTAAL: 150