



education

**MPUMALANGA PROVINCE
REPUBLIC OF SOUTH AFRICA**

**NATIONAL
SENIOR CERTIFICATE / NATIONALE SENIOR
SERTIFIKAAT**

GRADE / GRAAD 12

PHYSICAL SCIENCES / FISIESE WETENSKAPPE: PHYSICS

**PRE-TRIAL PAPER 1 MARKING GUIDELINES
VOORBEREIDENDE EKSAMEN 1 MERKRIGLYNE**

AUGUST / AUGUSTUS 2026

MARKS / PUNTE: 150

**This marking guidelines consists of 15 pages
Hierdie merkriglyne bestaan uit 15 bladsye**

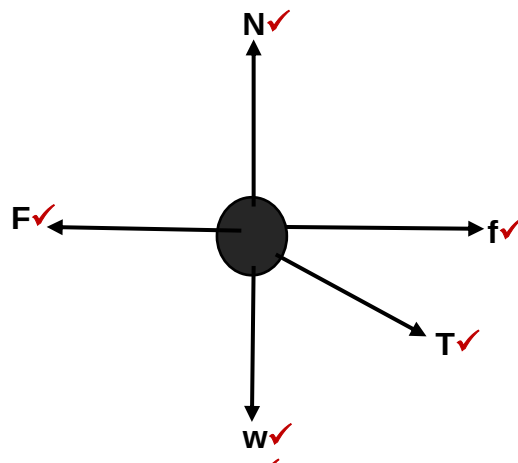
QUESTION/VRAAG 1

- | | | |
|------|------|-----|
| 1.1 | B ✓✓ | (2) |
| 1.2 | C ✓✓ | (2) |
| 1.3 | A ✓✓ | (2) |
| 1.4 | B ✓✓ | (2) |
| 1.5 | A ✓✓ | (2) |
| 1.6 | C ✓✓ | (2) |
| 1.7 | D ✓✓ | (2) |
| 1.8 | D ✓✓ | (2) |
| 1.9 | A ✓✓ | (2) |
| 1.10 | C ✓✓ | (2) |

[20]

QUESTION/VRAAG 2

2.1.1



Accepted labels/Aanvaarde byskrifte	
N	F_N / Normal force/Normaalkrag
F	Applied force/Toegepaste krag/ F_A
f	F_f / f_s / (static/statiese) friction/wrywing
w	F_g / F_w / weight/mg/ mg/ gravitational force/gewig/gravitasiekrag
T	F_T /Tension force/Spanningskrag

2.1.2 [If any one of the underlined key words/phrases in the **correct context** is omitted, deduct 1 mark/As enige van die onderstreepte sleutelwoorde/frases in die **korrekte konteks** uitgelaat is, trek 1 punt af] (5)

When a net/resultant force acts on an object, the object will accelerate in the direction of the net force and the acceleration is directly proportional to the net force and inversely proportional to the mass of the object. ✓✓

Wanneer 'n netto/resultante krag op 'n voorwerp uitgeoefen word, sal die voorwerp in die rigting van die netto krag versnel en die versnelling is direk eweredig aan die netto krag en omgekeerd eweredig aan die massa van die voorwerp. (2)

2.1.3

Block/Blok A	Block/Blok B
$F_{net} = ma$ ← Any/Enige 1 ✓ $F_A + (f) + (-T \cos \theta) = ma$ $46,5 - 12 - T \cos 25^\circ = 5,2a$ ✓ $34,5 - 0,9063T = 5,2a$ $0,9063T = 34,5 - 5,2a$ -----(a)	$F_{net} = ma$ $T \cos \theta + (-f) = ma$ $T \cos 25 - 5,1 = 2a$ ✓ $0,9063T = 2a + 5,1$ -----(b)
(a) = (b) $34,5 - 5,2a = 2a + 5,1$ ✓ $a = 4,083 \text{ m.s}^{-2}$	$0,9063T = 2a + 5,1$ $0,9063T = 2(4,083) + 5,1$ $T = 14,637 \text{ N}$ ✓

2.1.4 DECREASED/AFGENEEM ✓

- The normal force will increase. ✓
- Therefore, the frictional force will also increase. ✓
- *Die normaalkrag sal toeneem*
- *Daarom sal die wrywingskrag ook toeneem*

(3)

2.2

$$g = \frac{GM}{r^2} \cdot \checkmark$$

$$g = \frac{(6,67 \times 10^{-11})(6, \times 10^{23}) \checkmark}{(3,39 \times 10^6)^2}$$

$$g = 3,71 \text{ m.s}^{-2} \checkmark$$

(3)

[19]

QUESTION/VRAAG 3

3.1.1

Marking criteria/Merkriglyne	Marks/Punte
Correct formulae used / <i>Korrekte formules gebruik</i>	✓
Correct substitution / <i>Korrekte vervanging</i>	✓
Correct answer with corrects SI units <i>Korrekte antwoord met SI eenhede</i>	✓

Option/Opsie 1

Downwards positive/Afwaarts positief

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

$$v_f^2 = (2)^2 + 2(9,8)(45) \quad \checkmark$$

$$v_f = 29,77 \text{ m} \cdot \text{s}^{-1} \quad \checkmark$$

Option/Opsie 2

Downwards negative/Afwaarts negatief

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

$$v_f^2 = (2)^2 + 2(-9,8)(45) \quad \checkmark$$

$$v_f = -29,77 \text{ m} \cdot \text{s}^{-1}$$

$$v_f = 29,77 \text{ m} \cdot \text{s}^{-1} \text{ downwards/afwaarts} \quad \checkmark \quad (3)$$

3.1.2

The balls hit the water at the same instant./Die bal tref die water op dieselfde oomblik.

Ball A/Bal A

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

$$29,77 = 2 + (9,8)\Delta t \quad \checkmark$$

$$\Delta t = 2,83 \text{ s} \quad \checkmark$$

Ball B/Bal B

$$\Delta t_B = 2,83 - 1 = 1,83 \text{ s} \quad \checkmark$$

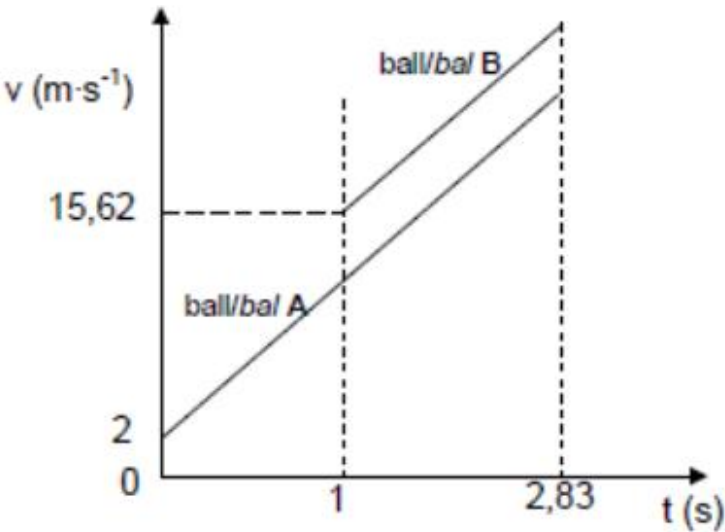
(3)

3.1.3

$\Delta t_B = 1,83\text{ s} \checkmark$
 $\Delta y = v_i \Delta t + \frac{1}{2} a \Delta t^2 \checkmark$
 $45 \checkmark = v_i(1,83) + \frac{1}{2}(9,8)(1,83)^2 \checkmark$
 $v_i = 15,62\text{ m} \cdot \text{s}^{-1} \checkmark$

(5)

3.1.4



CRITERIA FOR MARKING / RIGLYNE VIR MERK KRITERIA VIR MERK/RIGLYNE VIR MERK	
1 mark for each initial velocity shown 1 punt vir elke beginsnelheid getoon	✓✓
Time of release of ball B ($t = 1\text{ s}$) Tyd van vrylaat van bal B	✓
Time of flight for both balls must be indicated as same on time axis Tyd van vlug vir beide balle moet as dieselfde op die tyd as getoon wees	✓
Shape: lines must be parallel or nearly so Vorm: lyne moet parallel of naasteby so wees	✓

(5)

[16]

QUESTION/VRAAG 4

- 4.1.1 The total linear momentum in a closed system remains constant. / is conserved. ✓✓

Die totale lineêre mometum bly behoue/konstant in 'n geslote sisteem.

(2 or 0)

(2)

- 4.1.2 $\left. \begin{aligned} \sum p_i &= \sum p_f \\ (m_1 + m_2)v_i &= m_1v_{1f} + m_2v_{2f} \end{aligned} \right\}$ ✓ Any one/Enige een

$$(2m + 4m)(0) \checkmark = 2m(2) + 4m(v_{2f}) \checkmark$$

$$-4m = 4mv_f$$

$$\therefore v_f = -1 \text{ m} \cdot \text{s}^{-1}$$

$\therefore v_f = 1 \text{ m} \cdot \text{s}^{-1}$ ✓ in the opposite direction to that of the boys ✓ In die teenoorgestelde rigting as die van die seuns

(5)

- 4.1.3 GREATER THAN/GROTER AS

(1)

4.2.1 $p = mv$ ✓

$$p = (50)(5) \checkmark$$

$$p = 250 \text{ kg} \cdot \text{m} \cdot \text{s}^{-1} \checkmark, \text{ (downwards/afwaarts)}$$

(3)

- 4.2.2 The product of the net force acting on an object and the time interval (during which the net force acts) ✓✓.

Die produk van die netto krag op 'n voorwerp uitgeoefen en die tydsinterval (waartydens die netto krag toegepas word)

(2)

4.2.3 $f_{net} = \frac{\Delta p}{\Delta t} \checkmark$

$$f_{net} = \frac{0 - 250 \checkmark}{(0,2)}$$

$$F_{net} = -1\,250 \text{ N}$$

$$F_{net} = 1\,250 \text{ N} \checkmark$$

(3)

- 4.2.4 GREATER THAN/GROTER AS ✓

(1)

- 4.2.5
- For the same momentum change, the stopping time (contact time) will be smaller (less) ✓✓

- the (upward) force exerted (on the learner) is greater ✓.

- *Vir dieselfde momentumverandering, is die stoptyd (kontaktyd) kleiner/minder*

- *Die opwaartse krag uitgeoefen (op die leerder) is groter*

(3)

[19]

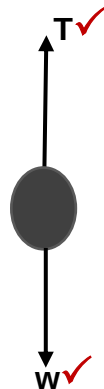
QUESTION/VRAAG 5

- 5.1 Tension ✓ Spanningskrag
Accept/Aanvaar: F_{applied} /Toegepas

(1)

- 5.2 **Accepted labels/Aanvaarde byskrifte**

w	F_g / F_w / weight/mg/ mg/ gravitational force/gewig/gravitasiekrag
T	F_T /Tension force/Spanningskrag



(2)

- 5.3

OPTION/OPSIE 1	OPTION/OPSIE 2
$W = F \cdot \Delta x \cdot \cos\theta$ ✓ $W_w = mg \cdot \Delta x \cdot \cos\theta$ ✓ $W_w = 75(9,8)(12) \cos 180^\circ$ ✓ $W_w = -8820 \text{ J}$ ✓	$W_w = -\Delta E_P$ ✓ $W_w = -(mgh - 0)$ ✓ $W_w = -(75)(9,8)(12)$ ✓ $W_w = -8820 \text{ J}$ ✓

(3)

- 5.4 [If any one of the underlined key words/phrases in the **correct context** is omitted, deduct 1 mark/As enige van die onderstreepte sleutelwoorde/frases in die **korrekte konteks** uitgelaat is, trek 1 punt af]

The net work done on an object is equal to the change in the object's kinetic energy ✓✓

Die netto arbeid verrig op 'n voorwerp is gelyk aan die verandering in die voorwerp se kinetiese energie.

OR/OF: The work done on an object by the net force is equal to the change in the Object's kinetic energy.

Die arbeid verrig op 'n voorwerp deur die netto krag wat gelyk is aan die verandering in die voorwerp se kinetiese energie.

(2)

5.5

$$W_{\text{net}} = \Delta E_k$$

$$F_{\text{net}} \cdot \Delta x \cdot \cos \theta = \left(\frac{1}{2} m v_f^2 - \frac{1}{2} m v_i^2 \right)$$

$$(75)(0,65)(12) \checkmark \cos 0^\circ \checkmark = \frac{1}{2}(75)(v_f^2 - 0) \checkmark$$

$$v_f = 3,95 \text{ m} \cdot \text{s}^{-1} (3,949 \text{ m} \cdot \text{s}^{-1}) \checkmark$$

✓ 1 mark for any of these

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

$$F_{\text{net}} = 75 \times 0,65$$

(5)
[13]**QUESTION/VRAAG 6**

6.1

$$6.1.1 \quad v = f\lambda$$

$$340 = 520 \lambda \checkmark$$

$$\lambda = 0,65 \text{ m} \checkmark$$

(2)

$$6.1.2 \quad f_L = \frac{v \pm v_L}{v \pm v_s} f_s \checkmark$$

$$f_L = \frac{340 + 0}{340 - 15} \checkmark (520) \checkmark$$

$$f_L = 544 \text{ Hz}$$

$$v = f\lambda \checkmark$$

$$340 = 544 \lambda \checkmark$$

$$\lambda = 0,63 \text{ m} \checkmark$$

(6)

6.2 The wavelength in QUESTION 6.1.2 is shorter because the wave fronts are compressed as they approach the observer. ✓✓

Die golflengte in VRAAG 6.1.2 is korter omdat die golffronte saamgepers word soos wat hul die waarnemer nader.

(2)

6.3 The red shift occurs when the spectrum of a distant star moving away ✓ from the earth is shifted toward the red end of the spectrum ✓

Die rooi verskuiwing vind plaas wanneer die spektrum van 'n verafgeleë ster wat weg van die Aarde beweeg, verskuif na die rooikant van die spektrum.

(2)

[12]

QUESTION/VRAAG 7

- 7.1 The magnitude of the charges are equal ✓
Die grootte van die ladings is gelyk

OR/OF

The balls repel each other with the same/identical force or force of equal magnitude ✓

Die balle stoot mekaar af met dieselfde identiese krag of krag van gelyke grootte. (1)

- 7.2 The magnitude of the electrostatic force exerted by one point charge (Q_1) on another point charge (Q_2) is directly proportional to the product of the magnitudes of the charges ✓ and inversely proportional to the square of the distance (r) between them: ✓

Die grootte van die elektrostatiese krag uitgeoefen deur een puntlading (Q_1) op 'n ander puntlading (Q_2) is direk eweredig aan die produk van die grootte van hul ladings en omgekeerd eweredig aan die kwadraat van die afstand (r) tussen hulle.

(2)

- 7.3.1 $T \cos 20^\circ = W$ ✓
 $T \cos 20^\circ = mg$
 $T \cos 20^\circ = (0,1)(9,8)$ ✓
 $T \cos 20^\circ = 0,98$
 $T = 1,04 \text{ N}$ ✓

(3)

- 7.3.2 **Positive marking from 7.3.1/Positiewe merk vanaf 7.3.1**

$$F_{\text{electrostatic}} = T \sin 20^\circ \quad \checkmark$$

$$\frac{kQ_1Q_2}{r^2} \quad \checkmark = T \sin 20^\circ$$

$$\frac{(9 \times 10^9)(250 \times 10^{-9})(250 \times 10^{-9})}{r^2} \quad \checkmark = 1,04 \sin 20^\circ$$

$$\frac{(9 \times 10^9)(250 \times 10^{-9})(250 \times 10^{-9})}{r^2} = 0,356 \quad \checkmark$$

$$r = 0,0397 \text{ m} \quad \checkmark$$

(5)

[11]

QUESTION/VRAAG 8

- 8.1.1
- Ensure that the wires have the same length. ✓
 - The same thickness/cross-sectional area ✓
 - *Verseker dat die geleidingsdrade dieselfde lengte is*
 - *Hul moet dieselfde dikte/deursnit-area bevat*

(2)

- 8.1.2 Wire/Draad **A** (Resistor A) A ✓

- NB Accept any correct coordinates chosen from the graph (calaculation of gradient/Aanvaar enige korrekte koördinate geneem vanaf die grafiek vir berekening van gradiënt)

$$R = \frac{V}{I} \checkmark$$

$$R_A = \frac{4,4 \checkmark}{0,4 \checkmark}$$

$$R_A = 11 \Omega \checkmark$$

$$R_B = \frac{2,2 \checkmark}{0,4 \checkmark}$$

$$R_B = 5,5 \Omega \checkmark$$

Nb;- For the same time and current, the heating in A will be higher because its resistance is higher than that of B/Vir dieselfde tydsinterval en stroom sal die verhitting in A hoër wees omdat die weerstand hoër is as vir B.

(8)

8.2.1

$$R = \frac{V}{I}$$

$$11 = \frac{V}{0,2} \checkmark$$

$$V = 2,2 V \checkmark$$

$$I_{5,5} = \frac{2,2}{5,5}$$

$$I_{5,5} = 0,4 A \checkmark$$

(3)

$$8.2.2 \quad I_{tot} = 0,4 + 0,2 \checkmark$$

$$I_{tot} = 0,6 \text{ A}$$

$$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} \checkmark$$

$$\frac{1}{R_p} = \frac{1}{11} + \frac{1}{5,5} \checkmark$$

$$R_p = 3,67 \Omega$$

$$R_{tot} = R_p + R_A$$

$$R_{tot} = 3,67 + 11 \checkmark$$

$$R_{tot} = 14,67 \Omega$$

$$\varepsilon = I(R + r) \checkmark$$

$$9 = 0,6(14,67 + r) \checkmark$$

$$r = 0,33 \Omega \checkmark$$

(7)

8.2.3 INCREASES/TOENEEM ✓

- The total resistance increases ✓/
- Total current decreases

- *Die totale weerstand neem toe*
- *Totale stroom neem af*

(2)
[22]

QUESTION/VRAAG 9

9.1

- Increase the speed of rotation. ✓/Toename in rotasiespoed

OR/OF

- Increase the number of coils/Toename in aantal windings

OR/OF

- Increase the strength of the magnetic field/Toename in sterkte van magneetveld

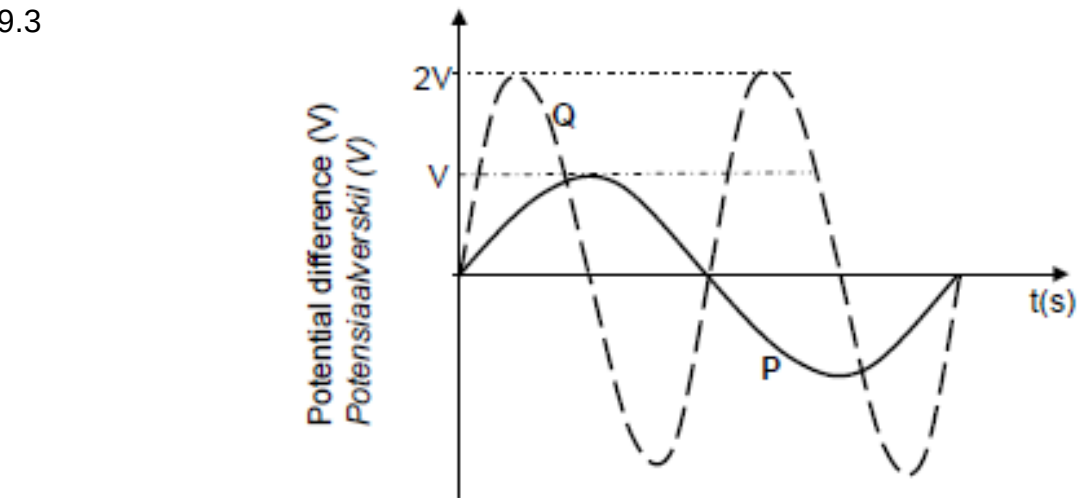
(1)

9.2

- Commutators replaced by slip rings. ✓/
- Slip rings were used.

- Split-ring kommutator vervang met sleepringe
- Sleepringe was gebruik

(1)



Criteria for graph	Marks
Correct shape with higher amplitude as shown (accept more than one cycle) <i>Korrekte vorm met hoër amplitude as getoon (aanvaar meer as een rotasie)</i>	✓
Correct shape with higher frequency as shown (accept more than one cycle) <i>Korrekte vorm met hoër frekwensie as getoon (aanvaar meer as een rotasie)</i>	✓

9.4

$$P_{ave} = \frac{V_{rms}^2}{R} \checkmark$$

$$P_{ave} = \frac{\left(\frac{V_{max}}{\sqrt{2}}\right)^2}{R} \checkmark$$

$$120 = \frac{\left(\frac{340}{\sqrt{2}}\right)^2}{R} \checkmark$$

$$R = 481,67\Omega \checkmark$$

(4)

9.5

- Can be stepped up or down ✓/
- can be transmitted with less power loss
- *Kan vermeerder en verminder word*
- *Kan oorgedra word met minder drywingsverlies*

(1)

[9]

QUESTION/VRAAG 10

- 10.1 It is the process whereby electrons are ejected from a metal surface when light of suitable frequency is incident on it. ✓✓ (2 or 0)

Die proses waardeur elektrone vrygestel word vanaf 'n metaaloppervlak wanneer lig van geskikte frekwensie daarop skyn.

(2)

10.2

Criteria for drawing the graph Kriterai vir stip van grafiek	Marks/Punte
ALL points correctly plotted (at least 3 points) <i>ALLE punte korrek gestip (ten minste 3 punte)</i>	✓✓
Correct line of best fit if all plotted points are used <i>Korrekte lyn van beste pas as al die gestipte punte gebruik is</i>	✓

(3)

- 10.3.1 **OPTION/OPSIE 1** ✓

$$\frac{1}{\lambda} = 1,6 \times 10^6 \text{ m}^{-1} \quad (\text{Accept } 1,6 \times 10^6 \text{ m}^{-1} \text{ to/tot } 1,7 \times 10^6 \text{ m}^{-1})$$

$$v = f \lambda \quad \checkmark$$

$$= (3 \times 10^8)(1,6 \times 10^6) \quad \checkmark$$

$$= 4,8 \times 10^{14} \text{ Hz} \quad \checkmark$$

(4)

OPTION/OPSIE 2 using point from the graph/gebruik punt van grafiek

$$E = W_0 + E_{k(\text{max})}$$

$$\frac{hc}{\lambda_0} = hf_0 + E_{k(\text{max})} \quad \checkmark$$

$$(6,63 \times 10^{-34})(3 \times 10^8)(1,6 \times 10^6) = (6,63 \times 10^{-34})f_0 + 0 \quad \checkmark$$

$$f_0 = 4,8 \times 10^{14} \text{ Hz} \quad \checkmark$$

[9]

TOTAL MARKS/TOTALE PUNTE [150]