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PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
EDUCATION

NATIONAL SENIOR CERTIFICATE

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GRADE/*GRAAD* 11

PHYSICAL SCIENCES: PHYSICS (P1)/*FISIESE WETENSKAPPE: FISIKA (V1)*

MARKING GUIDELINES/*NASIENRIGLYNE*

JUNE 2025/*JUNIE 2025*

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MARKS/*PUNTE*: 100

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

QUESTION 1/*VRAAG* 1

1.1. A✓✓ (2)

1.2. D✓✓ (2)

1.3. D✓✓ (2)

1.4. B✓✓ (2)

1.5. C✓✓ (2)

[10]

QUESTION 2/*VRAAG* 2

2.1. The resultant force is a single force having the same effect as two or more forces together. ✓✓/ *Die resulterende krag is 'n enkele krag wat dieselfde effek het as twee of meer kragte saam.* (2)

2.2.1 $R_y = 10\ N$ ✓

$R_x = -12 + 16 = 4\ N$ ✓

$F_{net}^2 = R_x^2 + R_y^2$

$F_{net}^2 = (4)^2 + (10)^2$ ✓

$F_{net} = 10.77\ N$ ✓ (4)

2.2.2

OPTION/*OPSIE* 1	OPTION/*OPSIE* 2	OPTION/*OPSIE* 3
$\tan\theta = \frac{R_y}{R_x}$ $= \frac{10}{(4)}$ ✓ $\theta = 68{,}20°$ ✓	$\sin\theta = \frac{R_y}{F_{net}}$ $\sin\theta = \frac{10}{10{,}77}$ ✓ $\theta = 68{,}20°$ ✓	$\cos\theta = \frac{R_x}{F_{net}}$ $\cos\theta = \frac{4}{10{,}77}$ ✓ $= 68{,}20°$ ✓

(2)

2.3.1 Equilibrant✓/*Ekwilibrant* (1)

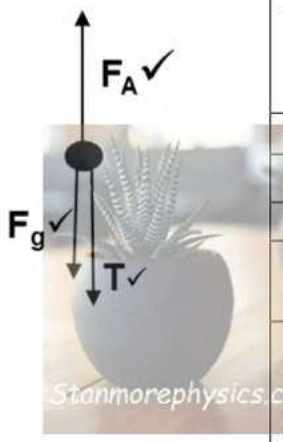
2.3.2 $R_x = 10{,}77\ N$, ✓ in the opposite direction✓ or 68,20° from negative *x* –axis/*in die teenoorgestelde rigting of 68,20° vanaf die negatiewe x-as.* (2)

[11]

QUESTION 3/VRAAG 3

3.1. A body will remain in its state of rest or motion at constant velocity✓ unless a non-zero resultant/net force acts on it. ✓/ *'n Liggaam sal in sy toestand van rus of beweging teen konstante snelheid bly tensy 'n nie-nul resulterende/netto krag daarop inwerk.* (2)

3.2.



Accepted labels/*aanvaarde byskrifte*	
w	F_g/F_w/weight/mg gravitational force/force of gravity/*gewig/mg gravitasie krag/krag van gravitasie*
T	F_T/Tension/F_{string}/*spanning/*F_{tou}
F_A	$F_{applied}$/$F_{toegepas}$
Notes/*notas*:	
Mark awarded for label and arrow/ *Punte toegeken vir byskrif en pyl*	
Do not penalise for length of arrows since drawing is not to scale./ *Moenie penaliseer vir die lengte van pyle nie, aangesien die tekening nie volgens skaal is nie*	
Any other additional force(s) - Max 2/3 / *Enige ander bykomende krag(te) - Maks 2/3*	
If force(s) do not make contact with body - Max 2/3. / *Indien krag(te) nie kontak met die liggaam maak nie - Maks 2/3.*	

(3)

3.3

$$\left.\begin{aligned} F_{net} &= ma \\ T + F_g + F_A &= ma \end{aligned}\right\}\checkmark$$

$$T + (8 \times (-9.8)) + 96 = 0 \checkmark$$

$$T = 17{,}6\ N \checkmark$$

(3)

3.4 Left✓ The block is slowing down✓/negative acceleration due to friction / *Links. Die blok beweeg stadiger/negatiewe versnelling as gevolg van wrywing* (2)

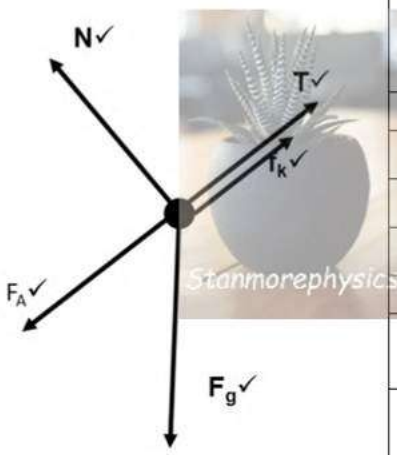
3.5 Increases✓/*neem toe* (1)

[11]

QUESTION 4/*VRAAG 4*

4.1.1. When a resultant/net force acts on an object, the object will accelerate in the direction of the force at an acceleration directly proportional to the force and inversely proportional to the mass of the object. ✓✓/ *Wanneer 'n resulterende/netto krag op 'n voorwerp inwerk, sal die voorwerp in die rigting van die krag versnel teen 'n versnelling wat direk eweredig is aan die krag en omgekeerd eweredig aan die massa van die voorwerp.* (2)

4.1.2.



Accepted labels/*aanvaarde byskrifte*	
w	F_g/F_w/weight/mg gravitational force/force of gravity/ *gewig/mg gravitasie krag/krag van gravitasie*
T	F_T/Tension/F_{string}/ *spanning*/F_{tou}
f_k	$F_{friction}$/F_f/Friction/$F_{wrywing}$/*Wrywing*
N	$F_{friction}$/Normal/F_N/*Normaal*
F_A	Force applied/*krag toegepas*
Notes/*notas*:	
Mark awarded for label and arrow / *Punte toegeken vir byskrif en pyl*	
Do not penalise for length of arrows since drawing is not to scale./ *Moenie penaliseer vir die lengte van pyle nie, aangesien die tekening nie volgens skaal is nie*	
Any other additional force(s) - Max 3/4 / *Enige ander bykomende krag(te) - Maks 2/3*	
If force(s) do not make contact with body – Max 3/4. /*Indien krag(te) nie kontak met liggaam maak nie - Maks 3/4.*	
NO MARK awarded for drawing Fg components./ *GEEN PUNTE toegeken vir die teken van Fg-komponente nie*	

(5)

4.1.3 $f_k = \mu N$ ✓
$f_k = (0{,}2)(9{,}8 \times 8)\cos 30°$ ✓
$f_k = 13{,}58\ N$ ✓ (3)

4.1.4 **POSITIVE MARKING FROM 4.1.3/ *POSITIEWE NASIEN VANAF 4.1.3***

8 kg Block/*8 kg blok*

$$\left.\begin{matrix} F_{net} = ma \\ T + f_k + F_{g//} = ma \end{matrix}\right\} \checkmark$$

$$F_A + F_{g//} - T - f_k = 0$$

$$20 + (9{,}8 \times 8)\sin 30° - T - 13{,}58\checkmark = 0$$

$$59{,}2 - T - 13{,}58 = 0$$

$$T = 45{,}62 \text{ N } \checkmark$$

Note: Accept using energy principles for full marks. Note: if using the systems approach, max. 2 marks.
[1 mark for formula and 1 mark for final answer only]/
***Let wel**: Aanvaar die gebruik van energiebeginsels vir volpunte. Let wel: indien die sisteembenadering gebruik word, maksimum 2 punte.*
[1 punt vir formule en 1 punt vir finale antwoord alleenlik] (3)

4.2.1 Every body in the universe attracts every other body with a force which is directly proportional to the product of their masses ✓ and inversely proportional to the square of the distance between their centres ✓/ *Elke liggaam in die heelal trek elke ander liggaam aan met 'n krag wat direk eweredig is aan die produk van hul massas en omgekeerd eweredig aan die kwadraat van die afstand tussen hul middelpunte.* (2)

4.2.2 $$m = \frac{F_g}{g} = \frac{809{,}48}{9{,}8} = 82{,}6 \text{ kg}\checkmark$$

$$F = \frac{Gm_1m_2}{r^2}\checkmark$$

$$F = \frac{(6{,}67\times10^{-11})(82{,}6)(1{,}794\times10^{25})\checkmark}{(\frac{1{,}914\times10^{7}}{2})^2\checkmark}$$

$F_g = 1079{,}21$ N /1,08 x 10^3 N✓ (4)

[19]

QUESTION 5/*VRAAG 5*

5.1 The magnitude of the electrostatic force exerted by one point charge on another is directly proportional to the product of the magnitudes of the charges and inversely proportional to the square of the distance between them. ✓✓/*Die grootte van die elektrostatiese krag wat deur een puntlading op 'n ander uitgeoefen word, is direk eweredig aan die produk van die groottes van die ladings en omgekeerd eweredig aan die kwadraat van die afstand tussen hulle*. (2)

5.2 Negative ✓/*Negatief* (1)

5.3



F_E	$F_{electrostatic}$/ F/ FM ON N/ electrostatic force/ FM/ *FM op N/elektrostatiese krag*
W	Fg / w/ mg/ gravitational force / Fw/ weight/ gravity/*gravitasie krag/gewig*
	Notes/*notas* • Do not penalise for length of arrows./ *Moenie penaliseer vir die lengte van pyle nie* • Any other additional force(s)/ *Enige ander bykomende krag(te)* – Max/*maks 1/2* • If arrows are omitted but correctly labelled: Max 1/2 / *Indien pyle weggelaat maar korrek benoem is: Maks 1/2* • If force(s) do not make contact with the dot: Max ½ / *Indien krag(te) nie kontak met die punt maak nie: Maks. 1/2*

(2)

5.4

Marking criteria/*nasien kriteria*

- Correct substitution to calculate weight of M/ *Korrekte vervanging om gewig van M te bereken*
- Coulomb's formula/ *Coulomb se formule*
- Substitute Fnet = 0/ mg = r^2 (equating forces)/ 0,02 = r^2 (equating forces) / *Vervang Fnet = 0/ mg = r^2 (stel kragte gelyk)/ 0,02 = r^2 (stel kragte gelyk)*
- Correct substitution into r^2 / *Korrekte vervanging in r^2*
- Correct final answer (accept negative value: 2,33 x 10^{-6} C to 2,32 x 10^{-6} C/ *Korrekte finale antwoord (aanvaar negatiewe waarde*: 2,33 x 10^{-6} C tot 2,32 x 10^{-6} C)

$F_g = mg$

$= (4,08 \times 10^{-4})(9,8)$ ✓

$= 3,998 \times 10^{-3} N$ or $4,0 \times 10^{-3} N$

$F = \frac{kQ_PQ_Q}{r^2}$ ✓

$F_{net} = mg - \frac{kQ_PQ_Q}{r^2}$

$0 = 3,998\ x\ 10^{-3}$✓ $- \frac{(9\times10^9)(Q_P)(4,08\times10^{-8})}{(0,5)^2}$✓

$Q_P = 2,72 \times 10^{-6}$ C✓

OR/*OF*

$F = \frac{kQ_PQ_Q}{r^2}$ ✓

$3,998 \times 10^{-3}$✓ $= \frac{(9\times10^9)(Q_P)(4,08\times10^{-8})}{(0,5)^2}$✓

$Q_P = 2,72 \times 10^{-6}$ C✓

(5)

5.5.1 Equal✓/*gelyk* (1)

5.5.2 Opposite✓/upwards/*teenoorgesteld/opwaarts* (1)

5.6 **POSITIVE MARKING FROM QUESTION 5.4/ POSITIEWE NASIEN VANAF VRAAG 5.4**

$E_{net} = E_1 + E_2$ ✓

$= \frac{kQ_Q}{r^2} + \frac{kQ_P}{r^2}$

$= \frac{(9\times10^9)(4,08\times10^{-8})}{(0,25)^2}$ ✓ $+ \frac{(9\times10^9)(2,72\times10^{-8})}{(0,25)^2}$ ✓

$= 5,88 \times 10^3 + 3,92 \times 10^3$ ✓

$= 9,79 \times 10^3$ N.C^{-1} upwards/towards P/*in the direction of P*✓/*Opwaarts/na P/In die rigting van P* (5)

[17]

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QUESTION 6/*VRAAG 6*

6.1 Faraday's law of electromagnetic induction: The magnitude of the induced emf across the ends of a conductor✓ is directly proportional to the rate of change in the magnetic flux linkage with the conductor✓/*Faraday se wet van elektromagnetiese induksie: Die grootte van die geïnduseerde emk oor die punte van 'n geleier is direk eweredig aan die tempo van verandering in die magnetiese vloedverbinding met die geleier.* (2)

6.2.1 $\Phi i = \beta A cos\ \theta$✓

$= (0{,}15)\pi r^2 cos\ \theta$

$= (0{,}15)(\pi \times 0{,}3^2) cos\ 0^\circ$ ✓

$= 4{,}24 \times 10^{-2}$ Wb

$\Delta\Phi = \Phi_f - \Phi_{ii}$ ✓

$= 0 - 4{,}24 \times 10^{-2}$

$= 4{,}24 \times 10^{-2} Weber/Wb$ ✓ (4)

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6.2.2 POSITIVE MARKING FROM QUESTION 6.2.1/*POSITIEWE NASIEN VANAF VRAAG 6.2.1*

$\varepsilon = \frac{-N\Delta\Phi}{\Delta t}$ ✓

$\varepsilon = \frac{(-60)(-4{,}24\times10^{-2})}{1{,}6}$ ✓

$= 1{,}59\ V$ ✓ (3)

6.3 Decrease ✓/*afneem*

The emf is inversely proportional to the time of rotation, ✓ thus if the time increases the emf will decrease. ✓ / *Die emk is omgekeerd eweredig aan die rotasietyd, dus as die tyd toeneem, sal die emk afneem* (3)

[12]

QUESTION 7/VRAAG 7

7.1 The potential difference across a conductor is directly proportional to the current✓ in the conductor at constant temperature (provided temperature and all other physical conditions are constant. ✓ / *Die potensiaalverskil oor 'n geleier is direk eweredig aan die stroom in die geleier teen konstante temperatuur (mits die temperatuur en alle ander fisiese toestande konstant is).*

(2)

7.2.1

OPTION/*OPSIE* 1	**OPTION/*OPSIE* 2**

$\frac{1}{R_{//}} = \frac{1}{R_1} + \frac{1}{R_2}$✓
$\frac{1}{R_{//}} = \frac{1}{1,5} + \frac{1}{7,5}$ ✓
$R_{//} = 1,25\Omega$
$R_{tot\ ext} = 1,25 + 6$ ✓
$R_{tot\ ext} = 7,25\ \Omega$✓
	$R_P = \frac{R_1 R_2}{R_1 + R_2}$ ✓
	$= \frac{1,5 \times 7,5}{1,5+7,5}$ ✓
	$R_{//} = 1,25\Omega$
	$R_{tot\ ext} = 1,25 + 6$ ✓
	$R_{tot\ ext} = 7,25\ \Omega$✓

(4)

7.2.2 **POSITIVE MARKING FROM QUESTION 7.2.1/*POSITIEWE NASIEN VANAF VRAAG 7.2.1***

OPTION/*OPSIE* 1	**OPTION/*OPSIE* 2**
$R = \frac{V}{I}$ ✓ $7,25 = \frac{V}{5,25}$ ✓ $V = 38,06\ V$ ✓	$R_{//} = \frac{V_2}{I}$ ✓ $1,25 = \frac{V_2}{5,25}$ ✓ $V_2 = 6,56V$ $R_{6\Omega} = \frac{V_{6\Omega}}{I}$ $6 = \frac{V_{6\Omega}}{5,25}$ $V_{6\Omega} = 31,5\ V$ $V_1 = V_2 + V_6$ $= 6,56 + 31,5$ $= 38,06\ V$ ✓

(3)

7.2.3 Smaller than ✓/*Kleiner as* (1)

7.3.1

Marking criteria/*nasien kriteria*:
If any of the underlined key words/phrases in the correct context is omitted deduct 1 mark/ *Indien enige van die onderstreepte sleutelwoorde/frases in die korrekte konteks weggelaat word, trek 1 punt af.*

Maximum work done by the battery per unit charge. ✓✓/ *Maksimum werk verrig deur die battery per eenheidslading.*
OR/*OF*
Maximum energy supplied by the battery per unit charge. ✓✓/ *Maksimum energie wat deur die battery per eenheidslading gelewer word*
OR/*OF*
The total amount of electric energy supplied by the battery per coulomb/per charge. ✓✓/ *Die totale hoeveelheid elektriese energie wat deur die battery per coulomb/per lading verskaf word.* (2)

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7.3.2 No ✓/*Nee* (1)

7.3.3 The battery has internal resistance. ✓/ *Die battery het interne weerstand*
OR/*OF*
Some energy per coulomb of charge/volts is used to overcome internal resistance. ✓/ *'n Sekere hoeveelheid energie per coulomb lading/volt word gebruik om interne weerstand te oorkom.*
OR/*OF*
There is a potential drop/lost volts inside the battery. ✓/ *Daar is 'n potensiële verlies (daling/afname) van volts binne die battery.*
OR
$\varepsilon = V_{ext} + V_{int}$
OR/*OF*
$\varepsilon > V_{ext}$ ✓ (1)

7.4.1 Decreases ✓ /*neem af* (1)

7.4.2 Increases ✓/neem toe (1)

7.4.3 When the voltmeter is connected/ *Wanneer die voltmeter gekoppel is*:

- No/very little current through the 1,5 Ω branch ✓/ *Geen/baie min stroom deur die 1,5 Ω-tak*
  OR/*OF*
  Branch with 1,5 Ω resistor is disabled/bypassed/ *Tak met 1,5 Ω weerstand is gedeaktiveer/omseil*
  OR/*OF*
  A voltmeter has a very high resistance/ *'n Voltmeter het 'n baie hoë weerstand*
  OR/*OF*
  The resistance of the parallel branch increases. /*Die weerstand van die parallelle tak neem toe*

- (Total) resistance of the circuit increases. ✓/*(Totale) weerstand van die stroombaan neem toe*

- Current in circuit decreases. ✓/ *Stroom in stroombaan neem af*

- $V_{internal}$/ Internal volts/ V_{lost} decreases. Therefore, external volts increase for a constant emf.✓/ *Vintern/ Interne spanning/ $V_{verlore}$ neem af. Daarom neem eksterne spanning toe vir 'n konstante emk.* (4)

[20]

TOTAL/*TOTAAL*: 100

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