Hillcrest High School

PHYSICAL SCIENCE P1

Nov 2025

Grade 11

MARKS: 125
TIME: 2,5 Hours

EXAMINER: Ms N. Badenhorst
MODERATOR: Mrs J. Knox-Whitehead

Question 1

1.1 C
1.2 C
1.3 D
1.4 B
1.5 B
1.6 B
1.7 D
1.8 A
1.9 A

Question 2

2.1 0 N ✓ (1)

2.2 A body will remain in its state of rest or motion at constant velocity unless a non-zero resultant/net force acts on it. ✓✓ (2)

2.3.1 $T_{x1} = T_1 \times \cos 30^\circ$

$= 381{,}05 \times \cos 30^\circ$ ✓

$= 330$ N West/ left ✓

$T_{y1} = T_1 \times \sin 30^\circ$ (4)

$= 381{,}05 \times \sin 30^\circ$ ✓

$= 190{,}53$ N North/ up ✓

2.3.2 $T_{y2} = T_2 \times \sin 60^\circ$

$= 660 \times \sin 60^\circ$ ✓

$= 571{,}58$ N North/ up (3)

$T_{xnet} = 0$ N and $T_{ynet} = 0$ N Equilibruim

$\therefore \quad T_{y2} + T_{y1} = F_g = m \times g$

$571{,}58 + 190{,}53 = m \times 9{,}8$ ✓

$m = 77{,}77$ kg

Or

$Fg^2 = T_1^2 + T_2^2$

$= 381{,}05^2 + 660^2$ ✓

$Fg = 762{,}1018$ N

$Fg = m.g$

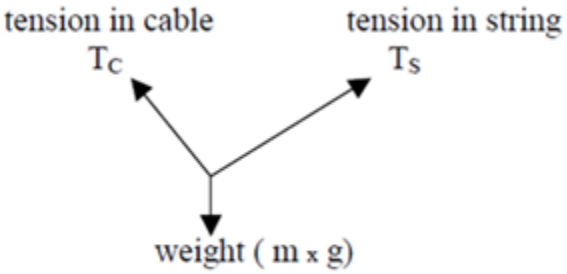
$762{,}1018 = m\,(9{,}8)$ ✓

$m = 77{,}77$ kg ✓

Question 3

3.1 Fg = m.g
= 0,8 (9,8)
= 7,84 N

3.2



3.3 $\frac{\sin\theta}{Ft} = \frac{\sin\theta}{Fg}$

$\frac{\sin 50}{Fc}$ ✓ $= \frac{\sin 100}{7,84}$ ✓

Fc = 6,1N ✓

$\frac{\sin\theta}{Ft} = \frac{\sin\theta}{Fg}$

$\frac{\sin 50}{Ft}$ ✓ $= \frac{\sin 100}{7,84}$ ✓

Ft = 3,98N ✓

3.4 $\frac{\sin\theta}{Fc} = \frac{\sin\theta}{Fg}$

$\frac{\sin 50}{8}$ ✓ = $\frac{\sin 100}{Fg}$ ✓

Fg = 10,2846 N

Fg = m.g

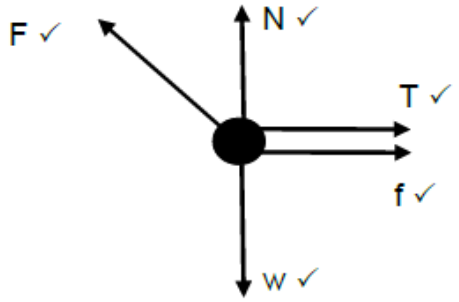
10,2846 = m(9,8) ✓

m = 1,05 kg ✓

Question 4

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

4.2



(5)

Accepted labels / Aanvaarde benoemings	
w	F_g / F_w / force of earth on block / weight / mg / gravitational force / VALUE
F	$F_{applied}$ / F_A / Applied force
T	Tension in rope / F_T
F	$F_{friction}$ / F_f / frictional force /
N	Normal force / F_N

4.3.1

Marking criteria/*Nasienkriteria*:
- Formula for block A or block B ✓
- Substitution of Fnet for block A ✓
- Substitusion of Fnet for block B ✓
- 8a **OR** 4a ✓
- Answer ✓

For Block A:
$F_{net} = ma$
$F_x + (-T) + (-f) = ma$ } Any one ✓
$(75)\cos 25 - T - 11,76$ ✓ $= 4a$ ✓
$56,21 - T = 4a$
$T = -4a + 56,21$

For Block B:
$F_{net} = ma$
$F_g + T + (-F) = ma$
$78,4 + T - 96$ ✓ $= 8a$
$T - 17,6 = 8a$
$T = 8a + 17,6$

$\therefore -4a + 56,21 = 8a + 17,6$
$12a = 38,61$
$a = 3,22\ m{\cdot}s^{-2}$ ✓

(5)

4.3.2

POSITIVE MARKING FROM QUESTION 2.3.1
Marking criteria/*Nasienkriteria*:
- Substitution to calculate T ✓
- Answer ✓

For Block A:	For Block B:
$T = -4a + 56,21$ $= (-4)(3,22) + 56,21$ ✓ $= 43,33$ N✓	$T = 8a + 17,6$ $= (8)(3,22) + 17,6$ $= 43,36$ N

(2)

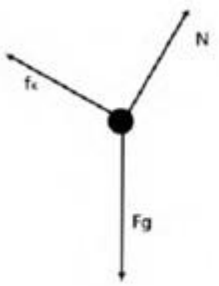
[14]

4.3.3 $F_N = Fg - F_{AY}$
$= 4(9,8) – 75 \sin 25$
$= 7,5$ N

Question 5

5.1 Kinetic friction/*Kinetiese wrywing* ✓✓ (1)

5.2



Marking criteria/*Nasien kriteria*:
All arrows, directions and headings should be correct.
Alle pyltjies, rigtings en byskrifte moet korrek wees.
- ✓ f_K
- ✓ N
- ✓ Fg

(3)

5.3 $F_{net\perp} = 0$ N ✓

$\therefore$ N = $Fg\perp$

$= 41,5 \times 9,8 \times \cos 25°$ ✓

= 368, 60 N ⊥ up/*opwaarts* (368,595 N)

$f_K = \mu_K N$ ✓

$= 0,12 \times 368,60$

= 44,23 N up/incline/*teen helling op* ✓ (4)

5.4 DECREASE/*AFNEEM* ✓

The coefficient of friction is a constant for a specific surface. ✓ An increase of the incline will decrease Fg ⊥ and therefore the normal $\therefore$ f_K will decrease as f_K is directly proportional to the normal. ✓

Question 6

6.1 Each body in the universe attracts every other body with a force that is directly proportional to the product of their masses✓ and inversely proportional to the square of the distance between their centres.✓ (2)

6.2

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

$$1.91 \times 10^{20}\checkmark = \frac{(6.67\times10^{-11})(5.98\times10^{24})(7.35\times10^{22})}{(6.38\times10^{6}+1.2\times10^{8}+R_m)^2}\checkmark$$

$$R_m = 2.65 \times 10^{8}\text{m}\ \checkmark$$ (5)

Remember to subtract the radius of the earth and distance between the planets surfaces (in km)

Or

$1{,}91 \times 10^{20} = \frac{6{,}67\ x\ 10^{-11}\ (5{,}98\ x\ 10^{24})(7{,}35\ x\ 10^{22})}{r^2}$

$r_{moon} = 391778406 - 1{,}2 \times 10^{5}(1000) - 6{,}38 \times 10^{6}$

$= 2{,}65 \times 10^{8}$m

Question 7

7.1.1 The magnitude of the electrostatic force exerted by one point charge on another point charge is directly proportional to the product of the magnitudes of the charges✓ and inversely proportional to the square of the distance between them.✓ (2)

7.1.2

(3)

7.1.3 $F_{net} = ma$

$mg + (-T) + (-\frac{kQ_1Q_2}{r^2}) = ma$ ✓

$[m(9.8) - 8✓ - \frac{(9\times10^9)(50\times10^{-9})(20\times10^{-9})}{(4\times10^{-2})^2}]$ ✓ $= 0✓$

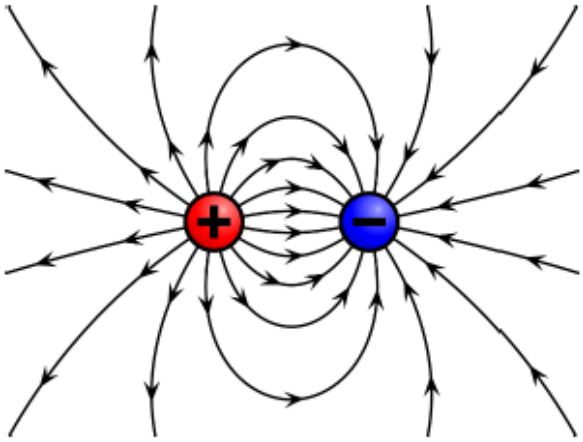
$m = 0.82\ kg$ ✓

$m_s = 0.82 \times 2 = 1.63kg$✓ (6)

Question 8

8.1 The electric field is an area in space where an electric charge experiences a force. ✓✓

8.2



Criteria for sketch/Kriteria vir skets	Marks/Punte
Correct shape as shown. Korrekte vorm soos getoon.	✓
Direction away from positive to negative. Rigting weg van positief na negatief.	✓
Field lines start on spheres and do not cross for correct diagram. Veldlyne begin op elke sfeer en kruis nie vir korrekte diagram.	✓

(3)

8.3

$E_{nett} = E_1 + E_2$

$E_{net} = \frac{kQ}{r^2} - \frac{kQ}{r^2}$ ✓ (Mark for/Punt vir $\frac{kQ}{r^2}$)

✓ $4\ 128 = \frac{(9x10^9)(5x10^{-9})}{r^2}$ ✓ − ✓ $\frac{(9x10^9)(4x10^{-9})}{(4r)^2}$ ✓

$4\ 128 = \frac{45}{r^2} - \frac{36}{16r^2}$

$r = 0{,}10\ m$ ✓

(6)

[11]

Question 9

9.1

The potential difference across a conductor is directlyproportional to the current in the conductor at constant temperature. ✓✓

9.1.2

OPTION/*OPSIE 1* 1	OPTION 2/*OPSIE 2*
$\frac{1}{R_P} = \frac{1}{R_1} + \frac{1}{R_2}$ ✓ $= \frac{1}{7+6}$ ✓ $+ \frac{1}{4+6}$ ✓ $R_P = 5{,}65\ \Omega$✓	$R_P = \frac{R_1 \times R_2}{R_1 + R_2}$ ✓ $= \frac{13\times10}{13+10}$ ✓✓ $R_P = 5{,}65\ \Omega$✓

(4)

9.1.3 **POSITIVE MARKING FROM/*POSITIEWE NASIEN VANAF* 8.2**

OPTION/*OPSIE 1* 1	OPTION 2/*OPSIE 2*
$\mathcal{E} = I(R_{ext} + r_{int})$ ✓ $15 = I(5{,}65 + 0{,}45)$ ✓ $I = 2{,}46\ A$✓	$R_T = \frac{V_T}{I}$ ✓ $(5{,}65 + 0{,}45) = \frac{15}{I}$ ✓ $I = 2{,}46\ A$✓

(3)

9.1.4

OPTION/*OPSIE* 1

$$r = \frac{V_{int}}{I} \checkmark$$
$$0{,}45 = \frac{V_{int}}{2{,}46} \checkmark$$
$$V_{int} = 1{,}11\ V$$

$$V_T = V_{ext} + V_{int}$$
$$15 = V_{ext} + 1{,}11$$
$$V_{ext} = 13{,}89\ V$$

$$R = \frac{V_{ext}}{I} \checkmark$$
$$5{,}65 = \frac{V_{int}}{2{,}46} \checkmark$$
$$V_{ext} = 13{,}89\ V$$

Current through/*Stroom deur* 7Ω & 6Ω

$$R = \frac{V}{I}$$
$$13 = \frac{13{,}89}{I} \checkmark$$
$$I = 1{,}07\ A$$

Current through/ *Stroom deur* 4Ω & 6Ω

$$R = \frac{V}{I}$$
$$10 = \frac{13{,}89}{I} \checkmark$$
$$I = 1{,}39\ A$$

Potential difference across/ *Potensiaalverskil oor* 7Ω

$$R_{7\Omega} = \frac{V}{I}$$
$$7 = \frac{V}{1{,}07} \checkmark$$
$$V = 7{,}49\ V$$

$$V_A = 13{,}89 - 7{,}49$$
$$= 6{,}40\ V$$

Potential difference across/ *Potensiaalverskil oor* 4Ω

$$R = \frac{V}{I}$$
$$4 = \frac{V}{1{,}39} \checkmark$$
$$V = 5{,}56\ V$$

$$V_B = 13{,}89 - 5{,}56$$
$$= 8{,}33\ V$$

$$V_2 = V_B - V_A$$
$$V_2 = 8{,}33 - 6{,}40$$
$$V_2 = 1{,}93\ V \checkmark$$

OPTION/*OPSIE* 2

$r = \frac{V_{int}}{I}$ ✓ $0,45 = \frac{V_{int}}{2,46}$ ✓ $V_{int} = 1,11\ V$	$R = \frac{V_{ext}}{I}$ ✓ $5,65 = \frac{V_{int}}{2,46}$ ✓ $V_{ext} = 13,89\ V$
Current through/*Stroom deur* 7Ω & 6Ω $R = \frac{V}{I}$ $13 = \frac{13,89}{I}$ ✓ $I = 1,07\ A$	**Current through/*Stroom deur* 4Ω & 6Ω** $R = \frac{V}{I}$ $10 = \frac{13,89}{I}$ ✓ $I = 1,39\ A$
Potential difference across/ *Potensiaalverskil oor* 6Ω $R_{6\Omega} = \frac{V(B)}{I}$ $6 = \frac{V}{1,39}$ ✓ $V = 8,34V$	**Potential difference across/ *Potensiaalverskil oor* 6Ω** $R = \frac{V(A)}{I}$ $6 = \frac{V}{1,07}$ ✓ $V = 6,42\ V$
$V_2 = V_B - V_A$ $V_2 = 8,34 - 6,42$ ✓ $V_2 = 1,92\ V$ ✓	

(7)

9.2 Increases/*Verhoog* ✓ (1)

9.3 Total resistance increases and total current decreases. ✓
V lost decreases ✓
Totale weerstand neem toe en totale stroom neem af.
V neem af (2)

Question 10

10.1.1 12 V ✓ (1)

10.1.2 $12 - 8$
$= 4$ V ✓ (1)

10.1.3

Option 1

gradient $= \frac{\Delta I}{\Delta V}$ ✓

$-\frac{1}{r}$ ✓ $= \frac{0-6}{12-0}$ ✓ [or any suitable co-ordinates]

$-\frac{1}{r} = -\frac{6}{12}$

r = 2 Ω ✓

Option 2

$r = -\frac{1}{\text{gradient}}$ ✓

$r = -\frac{1}{\frac{\Delta I}{\Delta V}}$ ✓

$r = -\frac{1}{\frac{0-6}{12-0}}$ ✓ [or any suitable co-ordinates]

r = 2 Ω ✓

Option 3

$V_{int} = Ir$ [lose formula mark]

4 ✓ $= 2r$ ✓ [or any suitable co-ordinates]

r = 2 Ω ✓ [max 3 marks] (4)