Hillcrest High School

PHYSICAL SCIENCE P1 MEMO

TRIALS 2025

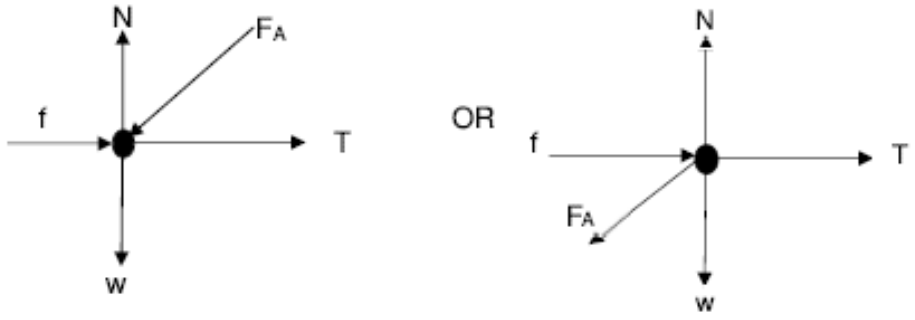
Question 1

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

Question 2

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

2.2



2.3

4kg
Fnet = m.a✓
Ft – Fg = m.a
Ft – 4(9,8) ✓ = 0
Ft = 39,2 N

9 kg
Fnet = ma
F.Cos Θ – fk – Ft = m.a
FCos 75 ✓– μ(F.Sin Θ + m.g) ✓ - Ft = 0✓
0,25882F – 0,1(0,9659F + 88,2) - Ft = 0

0,25882F – 0,1(0,9659F + 88,2) - 39,2 = 0

F = 296 N✓

2.2 $F = \frac{Gm1m2}{r^2}$ ✓

$$3660 = \frac{6{,}67\ X\ 10^{-11}(5{,}98\ X\ 10^{24})m2}{(6{,}38\ X\ 10^{6}+1000\ 000)^{2}}$$ ✓✓

m_2 = 499,766 kg

Fg = m.g
= 499,766 (9,8) ✓
= 4897,71 N ✓ **(5)**

Question 3

3.1 A projectile is an object which has been given an initial velocity ✓and then it moves under the influence of gravitational force/gravity/weight only.✓

3.2.1

UPWARDS AS POSITIVE *OPWAARTS POSITIEF*	DOWNWARDS AS POSITIVE *AFWAARTS POSITIEF*
$\Delta y = v_i\Delta t + \frac{1}{2} a\Delta t^2$✓	$\Delta y = v_i\Delta t + \frac{1}{2} a\Delta t^2$✓
$1,5$ ✓$= v_i (0,8) + \frac{1}{2} (-9,8)(0,8)^2$✓	$-1,5$ ✓$= -v_i(0,8) + \frac{1}{2} (9,8)(0,8)^2$✓
$v_i = 5,80 m.s^{-1}$upwards /*opwaarts*✓	$v_i = 5,80 m.s^{-1}$upwards /*opwaarts*✓

(4)

3.2.2 **POSITIVE MARKING FROM QUESTION 3.2.1**
POSITIEWE NASIEN VANAF VRAAG 3.2.1

OPTION 1/*OPSIE 1*	
UPWARDS AS POSITIVE *OPWAARTS POSITIEF*	DOWNWARDS AS POSITIVE *AFWAARTS POSITIEF*
$v_f^2 = v_i^2 + 2a\Delta y$✓	$v_f^2 = v_i^2 + 2a\Delta y$ ✓
$(5,80)^2 = (v_i)^2 + 2(-9,8)(8)$✓	$-(5,80)^2 = -(v_i)^2 + 2(9,8)8$✓
$v_i = 13,80 m.s^{-1}$ upwards/*opwaarts*✓	$v_i = 13,80 m.s^{-1}$upwards/*opwaarts*✓
OPTION 2/*OPSIE 2*	
$\frac{1}{2} m v_i^2 + mgh_i = \frac{1}{2} m v_f^2 + mgh_f$ ✓	
$\frac{1}{2} mv_i^2 + 0 = \frac{1}{2} m(5,80)^2 + m(9,8)(8)$✓	
$v_i = 13,80 m.s^{-1}$upwards/*opwaarts* ✓	

(3)

3.2.3

POSITIVE MARKING FROM QUESTION 3.2.2
POSITIEWE NASIEN VANAF VRAAG 3.2.2

$v_f^2 = v_i^2 + 2a\Delta y$
$1,4^2 = 13,8^2 + 2(-9,8)\Delta y$✓
$\Delta y = 9,62 m$

OR/*OF*

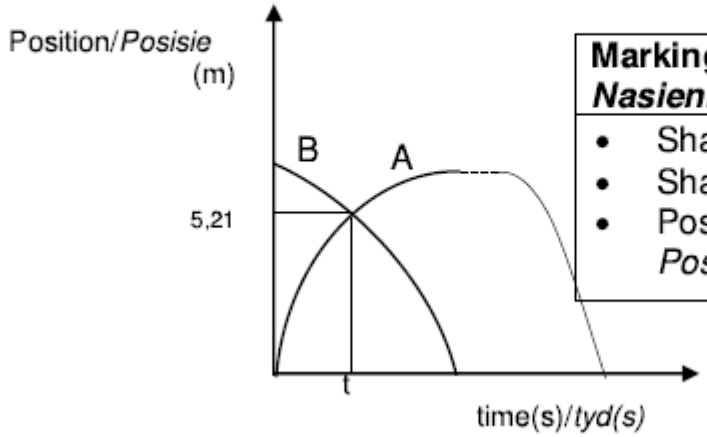
$\frac{1}{2} m v_i^2 + mgh_i = \frac{1}{2} m v_f^2 + mgh_f$
$\frac{1}{2} m(13,8)^2 + 0 = \frac{1}{2} m(1,4)^2 + m(9,8)(\Delta y)$ ✓
$\Delta y = 9,62 m$

$\Delta y = v_i\Delta t + \frac{1}{2} a\Delta t^2$✓
$\Delta y = 13,8\Delta t + \frac{1}{2} (-9,8) \Delta t^2$✓ .....(1)
$9,62 - \Delta y = 8\Delta t + 4,9\Delta t^2$✓ .....(2)
$\Delta t = 0,44 s$

$\Delta y = (13,8)(0,44) - (4,9)(0.44)^2$✓
$\Delta y = 5,12 m$ ✓

(6)

3.3 **POSITIVE MARKING FROM QUESTION 3.2.3**
POSITIEWE NASIEN VANAF VRAAG 3.2.3



Marking guidelines
Nasienriglyne

- Shape of A/*Vorm van A*✓✓
- Shape of B/*Vorm van B*✓
- Position of t and 5,21/ *Posisie van t en* 5,21✓

(4)

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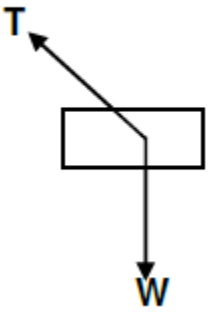
Question 4

4.1 The total linear momentum in an isolated system remains constant.

4.2



4.3

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

$0^2 = v_i^2 + 2(-9,8)(0,15)$ ✓

$v_i = 1,71\ m{\cdot}s^{-1}$

OR/OF

$(E_k + E_p)_i = (E_k + E_p)_f$

$½\ m\ v_i^2 + mgh_i = ½\ m\ v_f^2 + mgh_f$

$(½)(0,12)(v_i^2) + 0 = 0 + (0,12)(9,8)(0,15)$ ✓

$v_i = 1,71\ m.s^{-1}$

OR/*OF*

$W_{net} = ½\ m\ v_f^2 - ½\ m\ v_i^2$

$(0,12)(9,8)(0,15)(\cos 180) = 0 - (½)(0,12)(v_i^2)$ ✓

$v_i = 1,71\ m.s^{-1}$

OR/*OF*

$W_{nc} = mgh_f - mgh_i + ½\ m\ v_f^2 - ½\ m\ v_i^2$

$0 = (0,12)(9,8)(0,15) - 0 + 0 - (½)(0,12)(v_i^2)$ ✓

$v_i = 1,71\ m.s^{-1}$

OPTION 1/*OPSIE 1*

EAST/RIGHT AS POSITIVE/*OOS/REGS AS POSITIEF*

$\Sigma p_i = \Sigma p_f$
$m_1v_i + m_2v_i = m_1v_f + m_2v_f$ } ✓Any one/*Enige een*

$(0,095)(2,45) + (0,12)(0)$ ✓ $= (0,095)(v_f) + (0,12)(1,71)$✓

$v_f = 0,29\ m\cdot s^{-1}$✓

WEST/LEFT AS POSITIVE/*WES/LINKS AS POSITIEF*

$\Sigma p_i = \Sigma p_f$
$m_1v_i + m_2v_i = (m_1 + m_2)v_f$ } ✓Any one /*Enige een*

$(0,095)(-2,45) + (0,12)(0)$ ✓ $= (0,095)(v_f) + (0,12)(-1,71)$ ✓

$v_f = -0,29\ m\cdot s^{-1}$

$v_f = 0,29\ m\cdot s^{-1}$✓

Range $(0,28\ m\cdot s^{-1} - 0,29\ m\cdot s^{-1})$

OPTION 2/*OPSIE 2*

EAST/RIGHT AS POSITIVE/*OOS/REGS AS POSITIEF*

$\Delta p_x = -\Delta p_y$
$m(v_{xf} - v_{xi}) = -m(v_{yf} - v_{yi})$ } ✓Any one/*Enige een*

$0,095(v_f - 2,45)$ ✓ $= -0,12(1,71 - 0)$ ✓

$v_f = 0,29\ m\cdot s^{-1}$✓

WEST/LEFT AS POSITIVE/*WES/LINKS AS POSITIEF*

$\Delta p_x = -\Delta p_y$
$m(v_{xf} - v_{xi}) = -m(v_{yf} - v_{yi})$ } ✓Any one/*Enige een*

$0,095(v_f + 2,45)$ ✓ $= -0,12(-1,71 - 0)$ ✓

$v_f = -0,29\ m\cdot s^{-1}$

$v_f = 0,29\ m\cdot s^{-1}$✓

(5)

4.4 **POSITIVE MARKING FROM QUESTION 4.3**
POSITIEWE NASIEN VANAF VRAAG 4.3

OPTION 1/*OPSIE 1*

EAST AS POSITIVE/*OOS AS POSITIEF*

$F_{net}\Delta t = \Delta p$
$F_{net}\Delta t = m(v_f - v_i)$ ✓Any one/*Enige een*

$F_{net}(0,08) = 0,095(0,29 - 2,45)$ ✓ **OR/OF** $F_{net}(0,08) = 0,012(1,71 - 0)$ ✓

$F_{net} = -2,565$ N
$F_{net} = 2,57$ N✓

$F_{net} = 2,57$N✓

WEST AS POSITIVE/*WES AS POSITIEF*

$F_{net}\Delta t = \Delta p$
$F_{net}\Delta t = m(v_f - v_i)$ ✓Any one/*Enige een*

$F_{net}(0,08) = 0,095(-0,29 + 2,45)$✓**OR/OF** $F_{net}(0,08) = 0,12(-1,71 - 0)$ ✓

$F_{net} = 2,57$ N✓

$F_{net} = 2,57$
$F_{net} = 2,57$ N✓

OPTION 2/OPSIE 2

EAST AS POSITIVE
OOS AS POSITIEF

$v_f = v_i + a\Delta t$
$0,29 = 2,45 + a(0,08)$ ✓
$a = -27$ m·s^{-2}
$F_{net} = ma$✓
$= 0,095\ (-27)$
$= -2,565$ N
$= 2,57$ N

WEST AS POSITIVE
WES AS POSITIEF

$v_f = v_i + a\Delta t$
$-0,29 = -2,45 + a(0,08)$ ✓
$a = 27$ m·s^{-2}
$F_{net} = ma$✓
$= 0,095\ (27)$
$= 2,57$ N✓

(3)
[12]

Question 5

5.1 $P_{avg} = Fv_{avg}$ ✓

$57,6 = F \times 1,2$ ✓

$F = 48$ N ✓ (3)

5.2 The net work done on an object by a net force is equal to the change in the object's kinetic energy

5.3

$$W_{nc} = \Delta E_k + \Delta E_p$$

$$F\Delta x\cos\theta + f\Delta x\cos\theta = \left(\frac{1}{2}mv_f^2 - mv_i^2\right) + (mgh_f - mgh_i) \quad \checkmark \text{ formula}$$

$$48\left(\frac{1,6}{\sin 32°}\right)\cos(0) + [(0,25)(41,554)]\cos 180° \checkmark \left(\frac{1,6}{\sin 32°}\right) = \frac{1}{2}(5)v_f^2 - \frac{1}{2}(5)(1,2^2) \checkmark + 0 - (5)(9,8)(1,6) \checkmark$$

$$v_f = 8.84 \text{ m·s}^{-1} \quad \checkmark$$

Question 6

6.1 The change in frequency (or pitch) of a sound detected by a listener, because the sound source and the listener have different velocity relative to the medium of sound propagation.

6.2 Graph B. ✓
The frequency recorded is lower than the emitted frequency. ✓

OR

Lower frequency gives a longer wavelength, thus moving away. ✓

OR

Frequency decreases compared to emitted frequency

6.3 **OPTION 1/*OPSIE 1*:**

$$f_L = \frac{v \mp v_L}{v \mp v_S} \times f_S \checkmark$$

$$1100 = \frac{340}{340 - v_S} \times f_S \checkmark$$

$$f_S = \frac{1100 \times 340 - v_S}{340}$$

$$f_S = f_S$$

$$\frac{(1100)\,340 - v_S}{340} = \frac{(900)\,340 + v_S}{340} \checkmark$$

$$v_S = 34\ m.s^{-1} \checkmark$$

$$f_L = \frac{v \mp v_L}{v \mp v_S} \times f_S$$

$$900 = \frac{340}{340 + v_S} \times f_S \checkmark$$

$$f_S = \frac{900 \times 340 + v_S}{340}$$

Marking criteria:

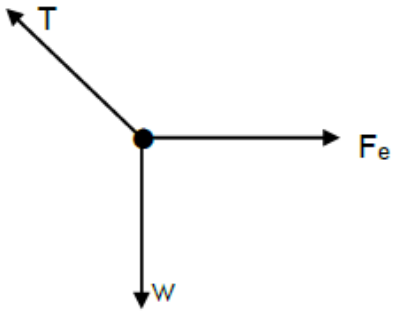
- ✓ Complete Doppler formula
- ✓ Substitution (towards) / *Vervanging (na)*
- ✓ Substitution (away)
- ✓ Equate f_s

(5)

Question 7

7.1.1 The magnitude of the electrostatic force exerted by point charge (at rest) on another (stationary) 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



Accepted labels	
T✓	Tension/F_T/$F_{wire\ on\ insulator}$
F_e✓	Electrostatic force / coulomb's force
w✓	F_g/mg/weight/gravitational force

7.1.3

$$F = \frac{kQ_1Q_2}{r^2}\checkmark$$

$$= \frac{(9 \times 10^{9})(6 \times 10^{-7})(9 \times 10^{-7})\checkmark}{(0,15)^2}$$

$$= 0,216\ N$$

$$w = mg$$

$$= \underline{(8 \times 10\text{-}2)(9,8)}\ \checkmark$$

$$= 0,784\ N$$

$$T_y = w = 0,784\ N$$

$$\tan\theta = \frac{T_x}{T_Y}$$

$$= \frac{0,216}{0,784}\checkmark$$

$$\theta = 15,40°\checkmark$$

(5)

7.2

$E = \frac{KQ}{r^2}$ ✓

✓

E_{Q_1} at p = E_{Q_2} at p

$\frac{(9 \times 10^9)(16 \times 10^{-7})}{(3,0 + x)^2}$ ✓ = $\frac{(9 \times 10^9)(4 \times 10^{-7})}{x^2}$ ✓

$\frac{x^2}{(3,0 + x)^2} = \frac{1}{4}$

$\frac{x}{3,0 + x} = \frac{1}{2}$

x = 3,0 m ✓

(5)

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Question 8

8.1 The maximum energy provided by a battery per unit charge passing through it.✓✓

8.2 8.2.1 3 V ✓ (1)

8.2.2 0,4 A ✓ (1)

8.3 Positive marking from QUESTION 8.2

Positiewe nasien van VRAAG 8.2

$R = \frac{V}{I}$ ✓

$= \frac{6 + 3}{0,2}$ ✓

$= 45\ \Omega$ ✓ (3)

Marking criteria/ **Nasienkriteria**:

- ✓ Formula/*Formule*
- ✓ Substitution/ *Vervanging*
- ✓ Answer/*Antwoord*

8.4 Positive marking from QUESTION 8.2
Positiewe nasien van VRAAG 8.2

OPTION 1/*OPSIE 1*:

$\frac{1}{R_p} = \frac{1}{R_1 + R_2} + \frac{1}{R_3}$ ✓

$= \frac{1}{15+7,5} + \frac{1}{45}$ ✓

$R_p = 15\ \Omega$

$R_T = R_s + R_p$

$= 4 + 15$ ✓

$= 19\ \Omega$

Marking criteria/ *Nasienkriteria*:

- ✓ Formula R_P / *Formule* R_P
- ✓ Substitution / *Vervanging*
- ✓ Substitution R_T
- ✓ Formule EMF/
- ✓ Substitution
- ✓ Answer

OPTION 2:

$V_p = 6+3 = 9V$ ✓

$I_p = 0,2 + 0,4 = 0,6\ A$ ✓

$$R_P = \frac{V_p}{I_p}$$

$$= \frac{9}{0,6}$$

$= 15\ \Omega$ ✓

$$R_T = R_S + R_P$$

$= 4 + 15$

$= 19\ \Omega$

emf = I(R+r) ✓

= (0,6)(19 + 1) ✓

= 12 V ✓

8.5 8.5.1 4,5 V ✓ (1)

8.5.2

gradient = - r = $\frac{\Delta y}{\Delta x}$

$= \frac{1,5 - 4,5}{5 - 0}$ ✓ ✓

$= -0,6$

$\therefore$ r = 0,6 Ω ✓ (3)

Question 9

9.1 AC (generator) ✓
It has two slip rings (AC). ✓✓
There is a handle to turn the coil/no power supply
OR
Sliprings for AC. ✓✓✓

WS (generator)
2 sleepringe (WS)
Daar is 'n handvatsel om die spoel te draai / geen kragbron
OF
Sleepringe vir WS (2)

9.2 B to A ✓ (1)

9.3 9.3.1 One and a half turns. ✓✓ OR 1 ½ OR 1,5 (2)

9.3.2 The rms current is the alternating current which dissipates/produces the same amount of energy as an equivalent direct current (DC). ✓✓

9.3.3 $I_{rms} = \frac{I_{max}}{\sqrt{2}}$ ✓

$= \frac{15}{\sqrt{2}}$ ✓

$= 10{,}61\text{A}$

$P_{ave} = I_{rms}^2 \text{ R}$ ✓

$= 10{,}61^2 \times 30$ ✓

$= 3377{,}16 \text{ W}$ ✓ (3375 W) (5)

9.4 $P_{ave} = V_{rms} I_{rms}$

2 200 = $240 I_{rms}$ ✓ if subscripts are omitted, subtract one mark

I_{rms} = 9,167 A *indien die onderskrifte weggelaat word, trek een punt af*

$I_{max} = I_{rms} \sqrt{2}$ ✓ formula mark goes for formula calculating the answer

I_{max} = (9,167) $\times (\sqrt{2})$ ✓ *formule punt word toegeken vir die formule wat die*

= 12,96 A ✓ *antwoord bereken* (4)

[17]

Question 10

10.1 The minimum energy that an electron in the metal needs to be emitted from the metal surface. ✓✓

10.2 Light source A – higher frequency than f_o ✓
OR Light source B – lower frequency than f_o

Ligbron A – hoër frekwensie as f_o
OF Ligbron B – laer frekwensie as f_o

Wavelength á $\frac{1}{f}$✓
Golflengte á $\frac{1}{f}$ (2)

10.3.1
$W_o = \frac{hc}{\lambda_0}$ ✓

$= \frac{(6,63\times10^{-34})(3\times10^{8})}{570\times10^{-9}}$ ✓

$= 3,489 \times 10^{-19}$ J ✓ (3)

10.3.2
POSITIVE MARKING FROM 10.3.1

$E = W_o + E_{k(max)}$ ✓

$\frac{hc}{\lambda} = W_o + \frac{1}{2}mv^2$

$\frac{(6,63\times10^{-34})(3\times10^{8})}{480\times10^{-9}}$ ✓ $= (3,489\times10^{-19})$ ✓ $+ \frac{1}{2}(9,11\times10^{-31})v^2$ ✓

$v = 3,79 \times 10^{5}$ m·s^{-1} ✓ (5)

10.4 Green/Groen✓ (1)

[13]