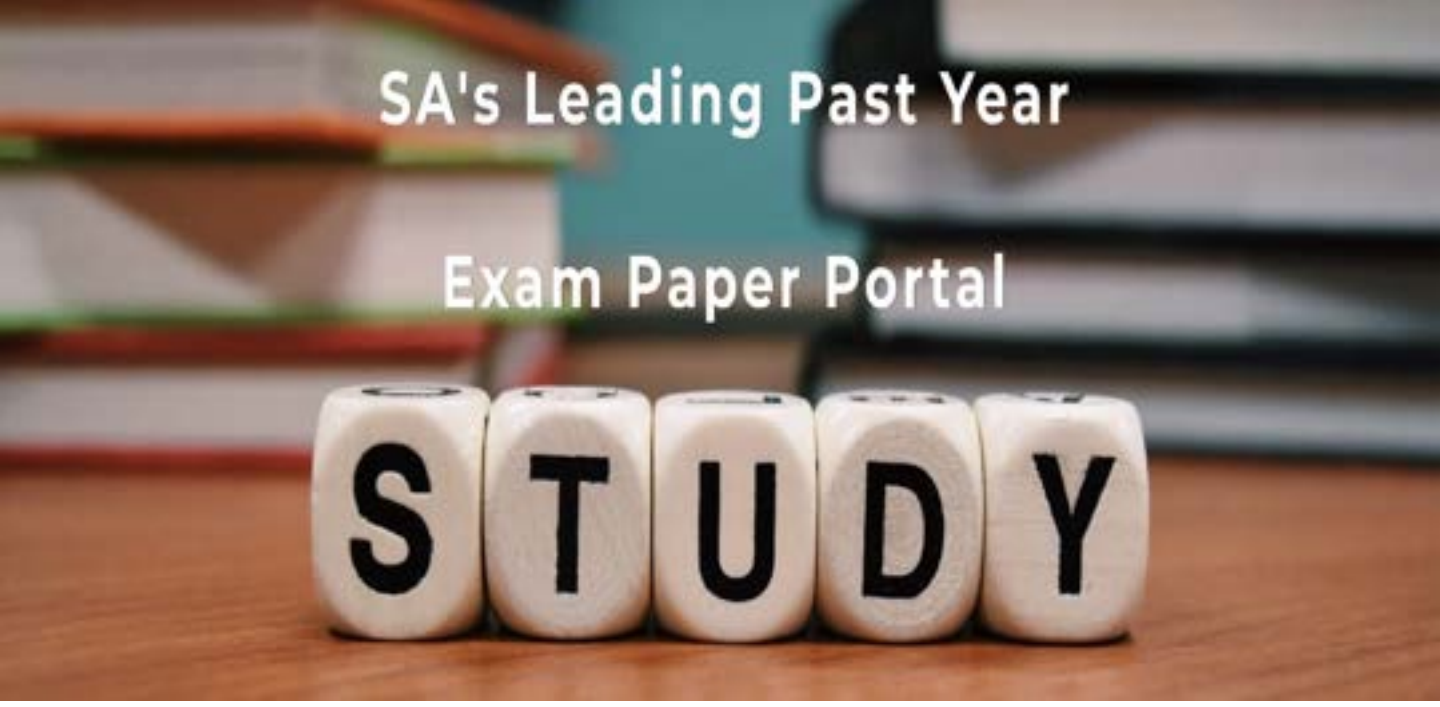


You have Downloaded, yet Another Great Resource to assist you with your Studies ☺

Thank You for Supporting SA Exam Papers

Your Leading Past Year Exam Paper Resource Portal

Visit us @ www.saexampapers.co.za

SA EXAM PAPERS

education

Department of Education
FREE STATE PROVINCE

PREPARATORY EXAMINATION
VOORBEREIDENDE EKSAMEN

GRADE/*GRAAD* 12

PHYSICAL SCIENCE: PHYSICS (P1)
FISIESE WETENSKAPPE: FISIKA (V1)

SEPTEMBER 2020

MARKS/*PUNTE*: 150

MARKING GUIDELINES
NASIENRIGLYNE

These marking guidelines consist of 18 pages.
Hierdie nasienriglyne bestaan uit 18 bladsye.

QUESTION/*VRAAG* 1

1.1 A ✓✓ (2)

1.2 B ✓✓ (2)

1.3 C ✓✓ (2)

1.4 D ✓✓ (2)

1.5 C ✓✓ (2)

1.6 B ✓✓ (2)

1.7 B ✓✓ (2)

1.8 B ✓✓ (2)

1.9 C ✓✓ (2)

1.10 B ✓✓ (2)

[20]

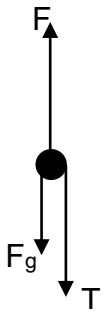
QUESTION/*VRAAG* 2

2.1.1 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 krag/netto krag op 'n voorwerp inwerk, sal die voorwerp in die rigting van die krag versnel wat direk eweredig is aan die krag en omgekeerd eweredig aan die massa van die voorwerp.

OR/OF

The net or resultant force acting on an object is equal to the rate of change of momentum of the object in the direction of the net force. ✓✓ (2 or 0)
Die netto/resulterende krag wat op 'n voorwerp inwerk, is gelyk aan die tempo van die verandering van momentum van die voorwerp in die rigting van die netto krag. (2)

2.1.2



(3)

Accept the following symbols/*Aanvaar die volgende simbole*		
F	$F_{applied}$ /Force applied/ *Toegepaste krag*/F_A	✓
F_g	w / F_w / weight */gewig*	✓
T	F_T / Tension/*Spanning*	✓

NOTE/*LET WEL*:

- Mark awarded for label and arrow./*Punt word toegeken vir byskrif en pyltjie.*
- Do not penalise for length of arrow since drawing is not to scale. *Moenie vir die lengte van pyltjies penalseer nie omdat diagram nie volgens skaal geteken is nie.*
- Any additional force(s)./*Enige addisionele krag(te):* $\frac{2}{3}$
- If force(s) do not make contact with body./*Indien krag(te) nie met die voorwerp kontak maak nie:* $\frac{2}{3}$
- No labels/*Geen byskrifte:* $\frac{0}{3}$

2.1.3 **Option/*Opsie* 1**

$f_k = \mu_k N$ ✓
$= \mu_k mg$
$= 0,3 \times 5 \times 9,8$ ✓
$= 14,7$ N ✓

Option/*Opsie* 2

$N = mg$
$= 5 \times 9,8$
$= 49$

$f_k = \mu_k N$ ✓
$= 0,3 \times 49$ ✓
$= 14,7$ N ✓

(3)

2.1.4 **POSITIVE MARKING FROM 2.1.3/*POSITIEWE NASIEN VANAF 2.1.3***

Option/*Opsie* 1

Direction of motion as positive/*Rigting van* b*eweging as positief*

$F_{net} = ma$ ✓

$F + F_g + T = ma$

$120 - 10 \times 9,8 - T = 10a$ ✓

$22 - T = 10a$

$F_{net} = ma$

$T - f_k = ma$ ✓

$T - 14,7 = 5a$ ✓

$a = 0,487$

$T - 14,7 = 5(0,487)$ ✓

$T = 17,13$ N ✓

OR

$T = 22 - 10a$

$= 22 - 10(0,487)$

$= 17,13$ N

Notes/*Aantekeninge:*
- ✓ Formula/*Formule*
- ✓✓ Substitution for forces/ *Vervanging van kragte*
- ✓ Substitution for both masses/*Vervanging vir beide massas*
- ✓ Equating Tension forces/ *Vergelyk spanningskragte*
- ✓ Answer with units/*Antwoord met eenhede*

(6)

Option/*Opsie* 2

Direction of motion as negative/*Bewegingsrigting as negatief*

$F_{net} = ma$ ✓

$F + F_g + T = ma$

$10 \times 9,8 + T - 120 = -10a$ ✓

$T - 22 = -10a$

$F_{net} = ma$

$f_k - T = -ma$ ✓

$14,7 - T = -5a$ ✓

$a = 0,487$

$14,7 - T = -5(0,487)$ ✓

$-T = -17,13$

$T = 17,13$ N ✓

OR

$T - 22 = -10a$

$T = 22 - 10(0,487)$

$= 17,13$ N

2.2.1 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)
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 is aan die kwadraat van die afstand tussen hul middelpunte.* ✓

2.2.2 $F_{planet/planeet} = \frac{1}{2} F_{earth/aarde}$ ✓

$G\frac{M_m 2M_e}{(X)^2} \overset{✓}{=} \frac{1}{2} G\frac{M_m M_e}{R^2}$ ✓

$4R^2 = (X)^2$

$2R = X$ ✓

***Notes/Aantekeninge*:**

✓ ✓Formula of Gravitational law applied for each object.
Formule van Gravitasiewet wat vir elke voorwerp toegepas word.
✓ Relationship between F_{planet} and $F_{earth.}$
Verhouding tussen $F_{planeet}$ en F_{aarde}
✓ Answer/*Antwoord*

(4)
[20]

QUESTION/*VRAAG* 3

3.1 Motion of an object under the influence of gravity/gravitational force/weight only.✓✓ (2 or 0)
Beweging van 'n voorwerp slegs onder die invloed van gravitasie/ gravitasiekrag/gewig.

OR/*OF*

Motion in which the only force acting on the object is gravity/gravitational force/weight.
Beweging waartydens die enigste krag wat inwerk gravitasie/gravitasie-krag/gewig is.

ACCEPT/*AANVAAR*

An object that is launched (or synonyms) with an initial velocity under the influence of the force of gravity only.
'n Voorwerp wat gegooi (of sinonieme) word met 'n aanvanklike snelheid onder die invloed van slegs gravitasiekrag. (2)

3.2 Newton's First Law/*Newton se Eerste Wet* ✓
A body will remain in its state of rest or motion at a constant velocity unless a non-zero net/resultant force acts on it.✓✓
'n Voorwerp sal in sy posisie van rus of beweging bly teen 'n konstante snelheid tensy 'n nie-nul netto/resulterende krag daarop inwerk. (3)

3.3.1 **OPTION/*OPSIE* 1** ↑ **+ Positive/*Positief*** **OPTION/*OPSIE* 2** ↑ **- Negative/*Negatief***

$v_f^2 = v_i^2 + 2a\Delta y$ ✓
$0 = (16)^2 + 2(-9,8)\Delta y$ ✓
$\Delta y = 13,06$

Height/*Hoogte* $= 13,06 + 2500$ ✓
$= 2513,06$ m ✓

$v_f^2 = v_i^2 + 2a\Delta y$ ✓
$0 = (-16)^2 + 2(9,8)\Delta y$ ✓
$\Delta y = -13,06$

Height/ *Hoogte* $= 13,06 +$ ✓ (2500)
$= 2513,06$ m ✓

(4)

3.3.2 **Option/*Opsie* 1**
Whole motion ↑ Positive
Algehele beweging *Positief*

$\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$ ✓
$= 16(15) + \frac{1}{2}(-9,8)(15)^2$ ✓
$= -862,5$
Height/*Hoogte* $= 2500 - 862,5$ ✓
$= 1637,5$ m ✓

Option/*Opsie* 2
Whole motion ↑ Negative
Algehele beweging *Negatief*

$\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$ ✓
$= -16(15) + \frac{1}{2}(9,8)(15)^2$ ✓
$= 862,5$
Height/ *Hoogte* $= 2500 - 862,5$ ✓
$= 1637,5$ m ✓

(5)

Option/*Opsie* 3

Motion from the maximum height. ↓ Positive

Beweging vanaf die maksimum hoogte. ↓ *Positief*

$V_f = v_i + g\Delta t$
$0 = 16 - 9{,}8\Delta t$
$\Delta t = 1{,}63$ s

$\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$ ✓
$= 0 + \frac{1}{2}(9{,}8)(13{,}37)^2$ ✓
$= 875{,}56$

Height/*Hoogte* $= 2513{,}06 - 875{,}56$ ✓
$= 1637{,}5$ m ✓

Option/*Opsie* 4

Motion from the maximum height. ↓ Negative

Beweging vanaf die maksimum hoogte. ↓ *Negatief*

$V_f = v_i + g\Delta t$
$0 = 16 - 9{,}8\Delta t$
$\Delta t = 1{,}63$ s

$\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$ ✓
$= 0 + \frac{1}{2}(-9{,}8)(13{,}37)^2$ ✓
$= -875{,}56$

Height/*Hoogte* $= 2513{,}06 - 875{,}56$ ✓
$= 1637{,}5$ m ✓

Option/*Opsie* 5

Motion point of projection down. ↓ Positive

Bewegingspunt van afwaartse projeksie. ↓ *Positief*

$V_f = v_i + g\Delta t$
$O = 16 - 9{,}8\Delta t$
$\Delta t = 1{,}63$ s

$\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$ ✓
$= 16(11{,}73) + \frac{1}{2}(9{,}8)(11{,}73)^2$ ✓
$= -862{,}5$

Height/*Hoogte* $= 2500 - 862{,}5$ ✓
$= 1637{,}5$ m ✓

RANGE/*GEBIED:* 1637,5 – 1638,1 m

Option/*Opsie* 6

Motion point of projection down. ↓ Negative

Bewegingspunt van afwaartse projeksie. ↓ *Negatief*

$V_f = v_i + g\Delta t$
$O = 16 - 9{,}8\Delta t$
$\Delta t = 1{,}63$ s

$\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$ ✓
$= -16(11{,}73) + \frac{1}{2}(-9{,}8)(11{,}73)^2$ ✓
$= -862{,}5$

Height/*Hoogte* $= 2500 - 862{,}5$ ✓
$= 1637{,}5$ m ✓

3.3.3 **OPTION/*OPSIE* 1**

Whole motion ↑ **+**
Algehele beweging

$\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$ ✓
$-2500 = 16\Delta t + \frac{1}{2}(-9,8)\Delta t^2$ ✓
$\Delta t = 24,34 s$ ✓

OPTION/*OPSIE* 2

Whole motion ↑ **-**
Algehele beweging

$\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$ ✓
$2500 = -16\Delta t + \frac{1}{2}(9,8)\Delta t^2$ ✓
$\Delta t = 24,34 s$ ✓

Note: For **options 3 and 4** use any of the equations of motion containing Δt to calculate Δt and substitute into equation of $\Delta y = v_i\Delta t + ½g\Delta t^2$.
Aantekening: *Vir* ***opsies 3 en 4****, gebruik enige van die bewegingsvergelykings wat Δt bevat om Δt te bereken en vervang in vergelyking van* $\Delta y = v_i\Delta t + ½g\Delta t^2$.

1) $v_f = v_i + g\Delta t$ $\Delta t = 1,633$ s
2) $\Delta y = \left(\frac{v_f + v_i}{2}\right)\Delta t$ $\Delta y = 13,061$ m; Max height/*Maks hoogte* = 2513,06 m
3) $\Delta y = v_i\Delta t + \frac{1}{2}g\Delta t^2$ $\Delta y = 13,061$ m; Max height/*Maks hoogte* = 2513,06 m

OPTION/*OPSIE* 3
Motion from maximum height ↑ **+**
Beweging vanaf maksimum hoogte

$v_f = v_i + a\Delta t$
$0 = 16 + (-9,8)\Delta t$
$\Delta t = 1,63 s$
$\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$ ✓
$-2513,06 = 0\Delta t + \frac{1}{2}(-9,8)\Delta t^2$ ✓
$\Delta t = 22,65 s$

$\Delta t = 22,65 + 1,63$
$= 24,28$ s ✓

OPTION/*OPSIE* 4
Motion from maximum height ↑ **-**
Beweging vanaf maksimum hoogte

$v_f = v_i + a\Delta t$
$0 = -16 + (9,8)\Delta t$
$\Delta t = 1,63 s$
$\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$ ✓
$2513,06 = 0\Delta t + \frac{1}{2}(9,8)\Delta t^2$ ✓
$\Delta t = 22,65 s$

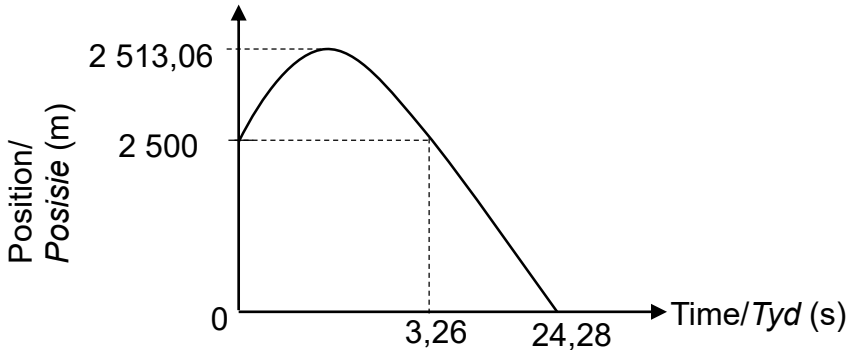
$\Delta t = 22,65 + 1,63$
$= 24,28$ s ✓

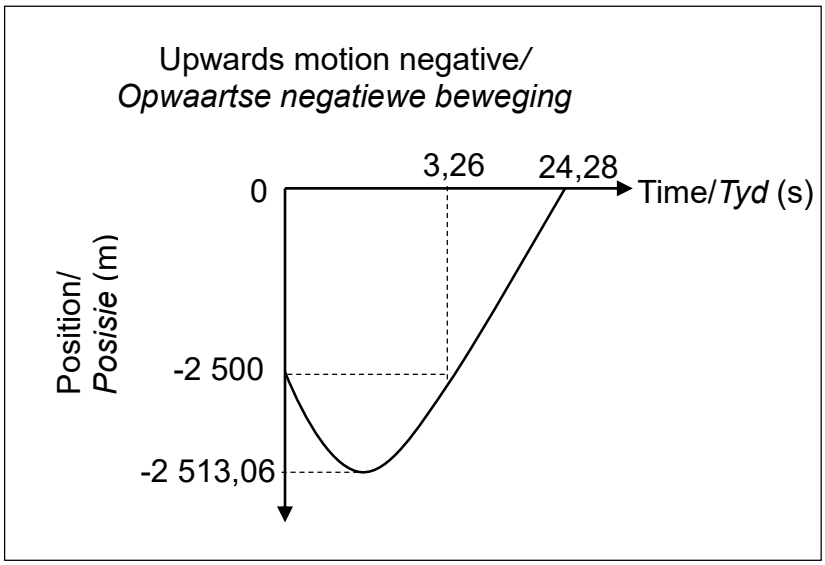
(4)

3.4 **POSITIVE MARKING FROM 3.3.3/*POSITIEWE NASIEN VANAF 3.3.3***

Take Ground as zero position/*Neem grond as zero-posisie*

Upward motion as positive./*Opwaartse beweging as positief.*





Marking criteria/*Nasienriglyne*

Graph with correct shape, starts at 2 500 and ends on x axis at t_f (24,28 s). *Grafiek met korrekte vorm begin by 2 500 en eindig op x-as by tf (24,28 s).*	✓
Maximum height/*Maksimum hoogte* (2513,06)	✓
Time of/*Tyd van* 24,28	✓

(3)
[21]

QUESTION/*VRAAG* 4

4.1 When object A exerts a force on object B, object B will simultaneously exert an oppositely directed force of equal magnitude on object A.✓✓ (2 or 0)
Wanneer voorwerp A 'n krag op B uitoefen, sal voorwerp B terselfdertyd 'n krag in die teenoorgestelde rigting, van gelyke grootte op voorwerp A uitoefen. (2)

4.2 Equal in magnitude ✓and opposite in direction.✓
Gelyk in grootte en rigting is teenoorgesteld. (2)

4.3 **Motion to the left/*Beweging na links* (+)**

$$\left.\begin{aligned} \Sigma P_f &= \Sigma P_i \\ (m_B + m_G)v_{iBG} &= m_B v_{fB} + m_G v_{fG} \end{aligned}\right\}$$ Any/*Enige* ✓

$(80 + 50)(4)$ ✓ $= 80(8) + 50v_{fG}$ ✓

$v_{fG} = 2{,}40\ m\cdot s^{-1}$ to the right/backwards ✓
na regs/terugwaarts (4)

Motion to the left/*Beweging na links* (-)

$$\left.\begin{aligned} \Sigma P_f &= \Sigma P_i \\ (m_B + m_G)v_{iBG} &= m_B v_{fB} + m_G v_{fG} \end{aligned}\right\}$$

$(80 + 50)(-4)$ ✓ $= 80(-8) + 50v_{fG}$ ✓

$v_{fG} = 2{,}40\ m\cdot s^{-1}$ to the right/backwards ✓
na regs/terugwaarts

4.4

OPTION/*OPSIE* 1:
Motion to left//*Beweging na links* +

$F_{net}\Delta t = \Delta p$ (boy/*seun*)
$= m(v_{fB} - v_{iB})$ } Any/*Enige* ✓
$= 80(8 - 4)$ ✓
$= 320$ ✓ N·s to the left/*na links* ✓

OR/*OF*

POSITIVE MARKING FROM 4.3/
POSITIEWE NASIEN VANAF 4.3

$F_{net}\Delta t = \Delta p$(girl/*dogter*)
$= m(v_{fB} - v_{iB})$ ✓ } Any/*Enige* ✓
$= 50(-2,4 - 4) = -320$
$= 320$ N·s to the right/
na regs ✓

$F_{net}\Delta t$ (boy/*seun*) = 320 N·s to the ✓
left/*na links*

OPTION/*OPSIE* 2:
Motion to right/Beweging na regs (+)

$F_{net}\Delta t = \Delta p$(boy/*seun*)
$= m(v_{fB} - v_{iB})$ } Any/*Enige* ✓
$= 80(-8 - (-4))$ ✓
$= -320$
$= 320$ ✓ N·s to the left/*na links* ✓

OR/*OF*

POSITIVE MARKING FROM 4.3/
POSITIEWE NASIEN VANAF 4.3

$F_{net}\Delta t = \Delta p$(girl/*dogter*)
$= m(v_{fB} - v_{iB})$ } Any/*Enige* ✓
$= 50(2,4 - (-4))$ ✓
$= 320$ N·s to the right/*na regs*

$F_{net}\Delta t$ (boy/*seun*) = 320 ✓ N·s to the
left/*na links* ✓

(4)
[12]

QUESTION/*VRAAG* 5

5.1 A force for which the work done in moving an object between two points is dependent of the path taken.✓✓ (2 or 0)
'n Krag waarvoor die arbeid wat verrig is om 'n voorwerp tussen twee punte te beweeg, afhanklik is van die pad wat gevolg word. (2)

5.2 Frictional (force)/*Wrywing (krag)*✓ (1)

5.3 **Option/*Opsie* 1**

$(U + K)_i = (U + K)_f$
$mgh_i + \frac{1}{2}mv^2_i = mgh_f + m\frac{1}{2}mv^2_f$ } Any/*Enige* ✓

$(38)(9,8)(0,75) + \frac{1}{2}\,38(1,5)^2$ ✓ $= 9,8(0) + \frac{1}{2}\,38v^2_f$ ✓
$v_f = 4,12\ m\cdot s^{-1}$ ✓ (4)

Option/*Opsie* 2

$W_{nc} = \Delta U + \Delta K$
$= mg(h_f - h_i) + \frac{1}{2}m(v_f^2 - v_i^2)$ } Any/*Enige* ✓
$0 = 38(9,8)(0 - 0,75) + \frac{1}{2}(38)(v_f^2 - 1,5^2)$ ✓
$v_f = 4,12\ m\cdot s^{-1}$ ✓

5.4
$$\left.\begin{aligned} f_k &= \mu_k N \\ &= \mu_k mg\cos\theta \end{aligned}\right\} \text{ Any/}\textit{Enige} \checkmark$$
$$= 0,21(38)(9,8)\cos 10° \checkmark$$
$$= 77,02 \quad \text{N} \checkmark$$
(4)

5.5 **POSITIVE MARKING 5.3 AND 5.4/*POSITIEWE NASIEN 5.3 EN 5.4***

Option/*Opsie* 1

$$\left.\begin{aligned} W_{net} &= \Delta K \\ W_f + W_{fg} &= \tfrac{1}{2}m(v_f^2 - v_i^2) \\ f_k\Delta x\cos\theta + mg\sin\theta\Delta x\cos\theta &= \tfrac{1}{2}m(v_f^2 - v_i^2) \end{aligned}\right\} \text{ Any/}\textit{Enige} \checkmark$$
$$77,016\Delta x\cos 180° + 38x9,8\sin 10°\Delta x\cos 0° = \tfrac{1}{2}(38)(0 - 4,12^2) \checkmark$$
$$-12,35\Delta x = -322,514$$
$$\Delta x = 26,11$$
$$\sin 10° = \frac{h}{\Delta x}$$
$$= \frac{h}{26,11} \checkmark$$
$$h = 4,535 \text{ m} \checkmark$$
(6)
[17]

QUESTION/*VRAAG* 6

6.1 It is the (apparent) change in frequency (or pitch) of the sound (detected by a listener) ✓ because the sound source and the listener have different velocities relative to the medium of sound propagation. ✓
Dit is die (waarskynlike) verandering in frekwensie (of toonhoogte) van die klank (soos waageneem deur 'n luisteraar) omdat die bron van die klankgolf en die waarnemer verskillende snelhede het relatief tot die medium van klankvoortplanting. (2)

OR/*OF*

An (apparent) change in (observed/detected) frequency (pitch), (wavelength) ✓as a result of the relative motion between a source and an observer ✓(listener).
'n (Waarskynlike) verandering in (waargenome) frekwensie (toonhoogte), (golflengte) as 'n gevolg van die relatiewe beweging tussen die bron en die waarnemer (luisteraar).

6.2 $v = f\lambda$ ✓
$340 = f(0,3)$ ✓
$f = 1133,33$ Hz ✓ (3)

6.3 **POSITIVE MARKING FROM 6.2/*POSITIEWE NASIEN VANAF 6.2***

$f = \frac{1}{T}$ ✓ **OR/*OF*** $f = \frac{\text{waves/}golwe}{\text{Time/}tyd}$ ✓

$= \frac{1}{8 \times 10^{-4}}$ ✓ $= \frac{2}{16 \times 10^{-4}}$ ✓

$= 1250$ Hz

$f_L = \left(\frac{v \pm v_L}{v \pm v_S}\right) f_s$ ✓ **OR/*OF*** $f_L = \left(\frac{v}{v - v_S}\right) f_s$

1250 ✓ $= \left(\frac{340}{340 - v_S}\right)$ ✓ $1133,33$ ✓

$v_s = 31,73$ m·s^{-1} ✓ (7)
[12]

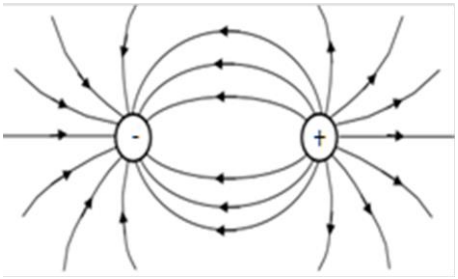
QUESTION/*VRAAG 7*

7.1 The electrostatic force of attraction or repulsion between two point charges is directly proportional to the product (of the magnitudes) of the charges✓ and inversely proportional to the square of the distance between them.✓
Die elektrostatiese aantrekkingskrag of afstootkrag tussen twee puntladings is direk ewereding aan die produk (van die groottes) van die ladings en omgekeerd eweredig aan die kwadraat van die afstand tussen hulle. (2)

NOTE/*LET WEL:*

-1 for every key word/phrase omitted. If **masses** used instead of charges, **0/2**.
*-1 vir elke sleutelwoord/frase wat uitgelaat is. Indien **massas** en nie ladings gebruik word nie, **0/2**.*

7.2



Marking criteria/*Nasienkriteria*

Correct direction away from the **+** sphere/*Korrekte rigting weg van die + sfeer*	✓
Shape of the electric field/*Vorm van die elektriese veld*	✓
Field lines starting on the sphere and not crossing/*Veldlyne begin op die sfeer en kruis nie*	✓

(3)

7.3

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

$$F_{13} = \frac{kQ_1Q_2}{r^2} = \frac{9\times10^9(6\times10^{-6})z}{(30\times10^{-2})^2} \checkmark$$

$$= 6\times10^5 z$$

$$F_{23} = \frac{kQ_2Q_3}{r^2} = \frac{9\times10^9(3\times10^{-6})z}{(10\times10^{-2})^2} \checkmark$$

$$= 27\times10^5 z$$

$$F_{net}^2 = F_{13}^2 + F_{23}^2$$

$$\underline{(13,83)^2 = (6\times10^5 z)^2 + (27\times10^5 z)^2} \checkmark$$

$$z = 5 \text{ x } 10^{-6} \text{ C} \checkmark$$

(5)

7.4 The electric field at a point is the (electrostatic) force experienced per unit positive charge placed at that point.
Die elektriese veld op 'n punt is die (elektrostatiese) krag wat ervaar word per eenheid positiewe lading wat op daardie punt geplaas word. (2)

NOTE/*LET WEL*:
- 1 for every key word omitted.
- *1 vir elke sleutelwoord wat uitgelaat is.*

7.5

$$E_{NET} = \frac{F_{NET}}{q} \checkmark$$

$$= \frac{13,83}{5 \text{ x } 10^{-6}} \checkmark$$

$$= 2,77 \text{ x } 10^{-6} \text{ N.C}^{-1} \checkmark$$

(3)
[15]

QUESTION/*VRAAG* 8

8.1 Potential difference across a conductor is directly proportional to the current ✓in the conducter provided the temperature is constant.✓
Potensiaalverskil oor 'n geleier is direk eweredig aan die stroom in die geleier *mits die temperatuur konstant is*. (2)

8.2 Emf of the battery/*Emk van die battery* ✓ (1)

8.3.1

Option/*Opsie* 1

$P = I^2R$ ✓
$45 = I^2(20)$ ✓
$I = 1,5A$ ✓

Option/*Opsie* 2

$P = \frac{V^2}{R}$
$45 = \frac{V^2}{20}$
$V = 30$

$R = \frac{V}{I}$ ✓
$20 = \frac{30}{I}$ ✓
$I = 1,5\ A$ ✓

(3)

8.3.2

Option/*Opsie* 1

$V_{lost} = Ir$✓
$3,25$✓ $= I(1)$✓
$I = 3,25$ A ✓

Option/*Opsie* 2

Emf/*Emk* = IR + Ir✓
$38,25$✓ $= 35 + I(1)$✓
$I = 3,25$ A ✓

(4)

8.3.3 **POSITIVE MARKING FROM 8.3.1 & 8.3.2**
***POSITIEWE NASIEN VANAF* 8.3.1 & 8.3.2**

Option/*Opsie* 1

$Emf = I(R_p + r)$ ✓
$38,25$✓ $= 3,25(R_p + 1)$ ✓
$R_p = 10,77\Omega$

$\frac{1}{R_p} = \frac{1}{R} + \frac{1}{R_{20+//}}$
✓$\frac{1}{10,77} = \frac{1}{R} + \frac{1}{23,33}$ ✓✓
$\frac{1}{R} = 0,05$
$R = 20\ \Omega$ ✓

Option/*Opsie* 2

$V_p = V_{Ext}$
$= 38,25 - 3,25$ ✓
$= 35V$

$V_p = IR_p$✓
$35 = 3,25R_p$✓
$R_p = 10,77\Omega$

Option/*Opsie* 3

$V_{20\Omega} = IR$
$= 1,5(20)$ ✓
$= 30V$

$V_p = V_{20\Omega} + V_{5\Omega}$
$= 30 + 5$
$= 35V$

(7)

8.4 Increase✓
Total resistance in circuit increase and the total current decrease. ✓
$V_{internal}$ will decrease. ✓
Therefore: $V_{external}$ will increase ✓ (because emf stays constant).

Toeneem
Totale weerstand in stroombaan neem toe en die totale stroom neem af.
V_{intern} sal afneem.
Daarom: $V_{ekstern}$ sal toeneem (omdat emk konstant bly). (4)
[21]

QUESTION/*VRAAG* 9

9.1 Generators: Electromagnetic induction ✓
Generators: Elektromagnetiese induksie (1)

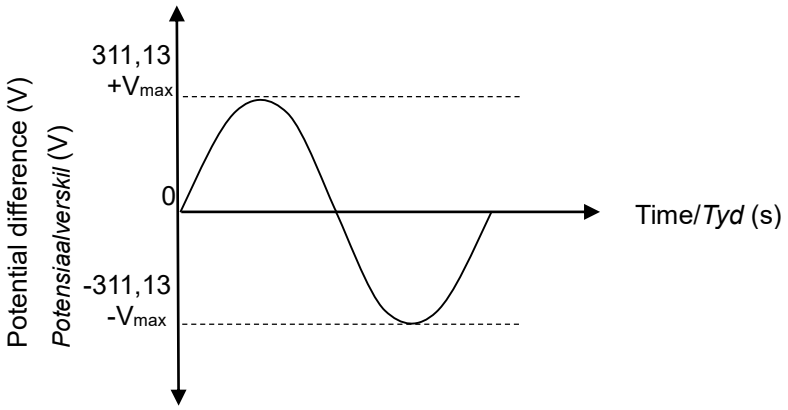
9.2 A ✓
Split ring commutator/*Spleetring kommutator* ✓ (2)

9.3.1 The *rms* voltage of AC is the DC potential difference which dissipates the same amount of energy as AC.✓✓
Die wgk spanning van WS is die GS-potensiaalverskil wat dieselfde hoeveelheid energie as WS verbruik. (2)

9.3.2
$$V_{rms} = \frac{V_{max}}{\sqrt{2}} \checkmark$$
$$220 = \frac{V_{max}}{\sqrt{2}} \checkmark$$
$$V_{max} = 311{,}13 \text{ V} \checkmark$$
(3)

9.3.3 Increase/*Neem toe* ✓ (1)

9.4 Graph of voltage versus time/*Spanning-teenoor-tydgrafiek*



(3)

Marking criteria/*Nasienkriteria*

Shape – sinusoidal curves *Vorm – sinusvormige krommes*	✓
Peak value/*Piek waarde*	✓
One cycle/*Een siklus*	✓

[12]

TOTAL/*TOTAAL*: 150