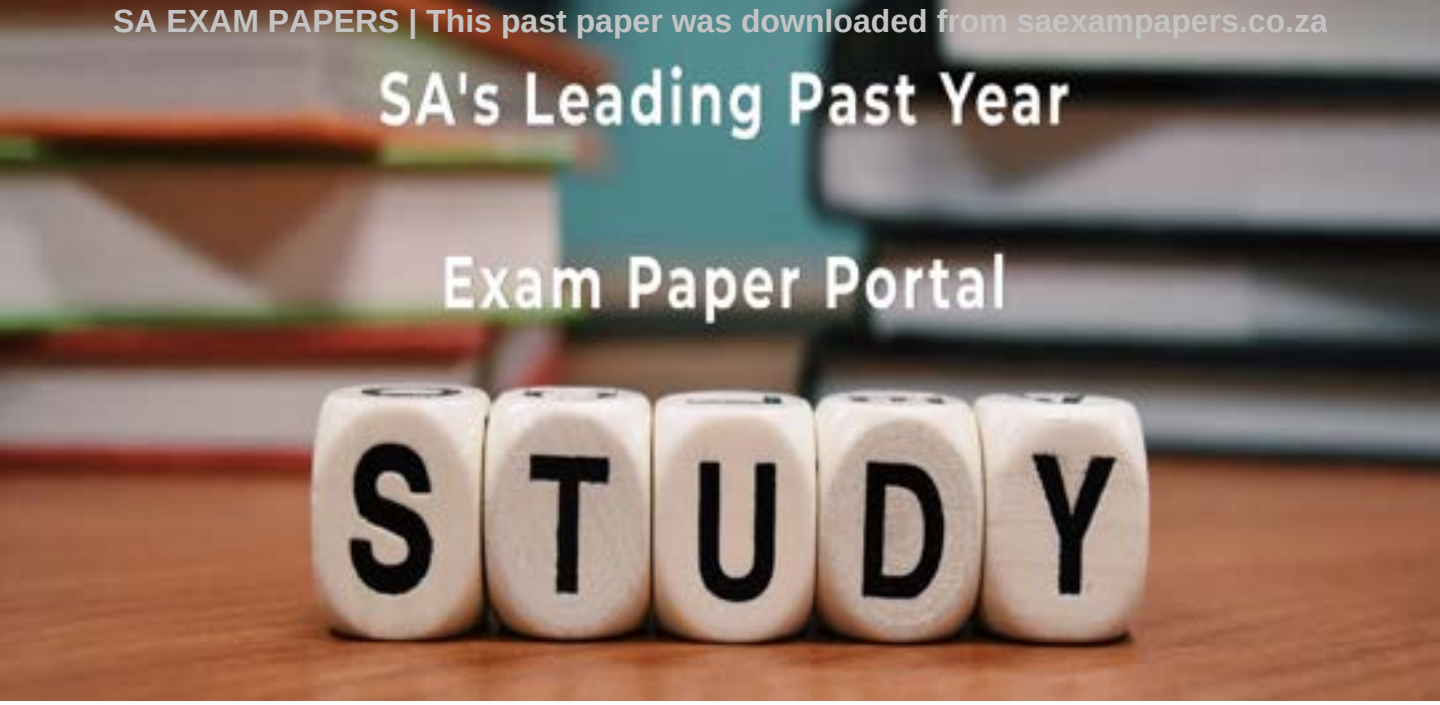

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JUNE EXAMINATION
JUNIE EKSAMEN

GRADE/*GRAAD* 12

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

JUNE 2025

MARKS/*PUNTE*: 150

MARKING GUIDELINES
NASIENRIGLYNE

This marking guideline consists of 15 pages.
Hierdie nasienriglyne bestaan uit 15 bladsye.

Please turn over/*Blaai om asseblief*

QUESTION/*VRAAG 1*

1.1 C ✓✓ (2)

1.2 A ✓✓ (2)

1.3 C ✓✓ (2)

1.4 A ✓✓ (2)

1.5 A ✓✓ (2)

1.6 B ✓✓ (2)

1.7 B ✓✓ (2)

1.8 D ✓✓ (2)

1.9 C ✓✓ (2)

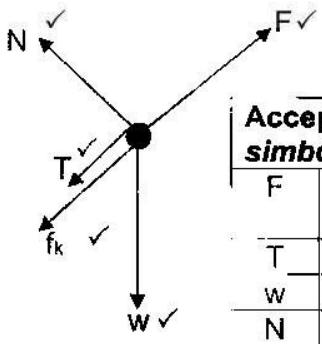
1.10 B ✓✓ (2)
[20]

QUESTION/*VRAAG 2*

2.1.1 Kinetic frictional force, f_k, is a force that opposes the motion of a moving object relative to a surface. ✓✓ **(2 or 0)**
Kinetiese wrywingskrag, f_k, is 'n krag wat die beweging van 'n bewegende voorwerp relatief tot 'n oppervlak teenstaan. ✓✓ ***(2 of 0)*** *(2)*

2.1.2 The two blocks are made up of two different materials.✓ (1)
Die twee blokke bestaan uit twee verskillende materiale.✓ *(1)*

2.1.3



Accept the following symbols / *Aanvaar die volgende simbole*		
F	**Force** applied / *Toegepaste krag* / F_A / 56,68 N	✓
T	F_T/Force on the rope / *Krag op die tou*	✓
w	F_g / weight / gewig	✓
N	F_N / Normal / *Normaal* / Normal force / *Normaalkrag*	✓
f_k	f / Friction / *Wrywing* / Frictional force / *Wrywingskrag* / Kinetic frictional force / *Kinetiese wrywingskrag*	✓

NB: Allocate ONE mark for each correct arrow and label.
Deduct one mark for any additional forces.

NB: *Ken EEN punt toe vir elke korrekte pyl en byskrif.*
Trek een punt af vir enige bykomende kragte. (5)

2.1.4 **Marking criteria**

- Correct formula: $\mathbf{F_{net} = ma}$ ✓
- Correct calculation of both frictional forces ✓✓
- Correct calculation of $F_{g//}$ ✓ (either)
- Correct substitution of ***a*** into the $\mathbf{F_{net} = ma}$ ✓ (either)
- Equating both tension equations ✓
- Final answer of **1,16 – 1,2** kg ✓

Kriteria vir die nasien

- *Korrekte* ***formule:*** $F_{net} = ma$ ✓
- *Korrekte* ***berekening*** *van beide wrywingskragte* ✓✓
- *Korrekte* ***berekening*** *van* $F_{g//}$ ✓ *(enigeen)*
- *Korrekte vervanging van* ***a*** *in die* $F_{net} = ma$ ✓ *(enigeen)*
- *Gelykstelling van beide spanningsvergelykings* ✓
- *Finale antwoord van 1,16 tot 1,20 kg* ✓

Block B / *Blok B* / *4m*

$F_{net} = ma$

$T + Fg// + f = ma$

$T + \mu_k N + Fg// = ma$

$T + \mu_k mg\cos30° + mg\sin30° = ma$ ✓

$T - \underline{0,4x4m(9,8)\cos30°} - \underline{4m(9,8)\sin30°} = 4m(2)$ Any ✓

$T - 33,179\ m = 8m$

Block A / *Blok A* / *m*

$F + T + Fg// + f = ma$ either ✓

$\mathbf{F + T + \mu_k N + Fg// = ma}$

$F + T + \mu_k mg\cos30° + mg\sin30° = ma$ ✓ Any ✓

$56.38 - T - \underline{0,1xm(9,8)\cos30°} - \underline{m(9,8)\sin30°} = m(2)$

$56,83 - \mathbf{T - 5,7487}\ m = 2m$

$T - 33,179\ m = 4(56,83 - T - 5,7487\ m)$ ✓

$m = 1,20$ kg ✓ (7)

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. ✓✓
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)

2.2.2

OPTION 1 / *OPSIE 1*

$g = G\frac{M}{d^2}$ ✓

$12 ✓ = 6{,}69 \times 10^{-11}\frac{M}{(700 \times 10^3)^2}$ ✓

$M = 8{,}81 \times 10^{22}\ kg$ ✓

OPTION 2 / *OPSIE 2*

$mg = F$

$mg = \frac{GM_pM_r}{r^2}$ ✓

$100 \times 12 ✓$

$= 6{,}69 \times 10^{-11}\frac{100M}{(700 \times 10^3)^2}$ ✓

$M = 8{,}81 \times 10^{22}\ kg$ ✓

(4)
[21]

QUESTION/*VRAAG* 3

3.1 $0\ m{\cdot}s^{-2}$ ✓ (1)

3.2 An object which has been given an initial velocity and then it moves under the influence of the gravitational force only.✓✓ (**2 or 0**)
'n Voorwerp wat 'n aanvanklike snelheid gegee is en dan beweeg dit slegs onder die invloed van gravitasiekrag.✓✓ (***2 of 0***)

3.3 0,2 s ✓ (1)

3.4 **Marking criteria**

- Penalise once if upward is taken as positive (option 2)
- Correct formula to calculate v_i: $v_f = v_i + g\Delta t$ / or any formular
- Correct substitution into the formula leading to the answer
- Final answer of $1{,}96\ m{\cdot}s^{-1}$

Kriteria vir die nasien

- *Penaliseer een keer as opwaarts as positief beskou word (opsie 2)*
- *Korrekte formule om v_i te bereken: $v_f = v_i + g\Delta t$ / of enige formule*
- *Korrekte vervanging in die formule wat tot die antwoord lei*
- *Finale antwoord van $1{,}96\ m{\cdot}s^{-1}$*

OPTION 1 / *OPSIE 1* **DOWNWARDS POSITIVE** ***AFWAARTS POSITIEF***	**OPTION 2 / *OPSIE 2*** **UPWARDS POSITIVE** ***OPWAARTS POSITIEF***
$v_f = v_i + g\Delta t$✓ $0 = v_i + (9,8)(0,2)$ ✓ $v_i = -1,96\ m{\cdot}s^{-1}$ velocity/*snelheid* = 1,96 m·s^{-1} ✓	$v_f = v_i + g\Delta t$✓ $0 = v_i + (-9,8)(0,2)$ ✓ $v_i = 1,96\ m{\cdot}s^{-1}$ Velocity/snelheid= 1,96 m·s^{-1} ✓ **Max / *MAKS*** $\left(\frac{2}{3}\right)$

(3)

3.5 **Marking criteria**

- Correct formula to calculate v_i: $\Delta y = v_i\Delta t + \frac{1}{2}g\Delta t^2$ / or any Δy formular
- Correct substitution into the formula leading to the answer
- Addition of 30 m
- Final answer 1,96 m·s^{-1}

Kriteria vir die nasien

- *Korrekte formule om v_i te bereken: $\Delta y = v_i\Delta t + \frac{1}{2}g\Delta t^2$ / of enige Δy-formule*
- *Korrekte vervanging in die formule wat tot die antwoord lei*
- *Byvoeging van 30 m*
- *Finale antwoord 1,96 m·s^{-1}*

POSITIVE MARKING FROM QUESTION 3.3
POSITIEWE NASIEN UIT VRAAG 3.3

OPTION 1 / *OPSIE 1*
Whole motion / *Hele beweging*

$\Delta y = v_i\Delta t + \frac{1}{2}g\Delta t^2$✓
$y_f = v_i\Delta t + \frac{1}{2}g\Delta t^2 + y_i$
$= \underline{-1,96(0,2) + \frac{1}{2}(9,8)(0,2)^2}$ ✓ + (-30)✓
$= -30,196$
Height / *Hoogte* = 30,196 m✓

OPTION 2 / *OPSIE 2*

$\Delta y = \left(\frac{v_i + v_f}{2}\right)\Delta t$✓
$= \left(\frac{-1,96 + 0}{2}\right)0,2$✓
$= -0,196\ m$

OPTION 3 / *OPSIE 3*

$v_f^2 = v_i^2 + 2g\Delta y$✓
$0^2 = (-1,96)^2 + 2(9,8)\Delta y$✓
$\Delta y =$ -0,196 m

OPTION 4 / *OPSIE 4*

$\Delta y = v_i\Delta t + \frac{1}{2}g\Delta t^2$✓
$0 = -1,96(0,2) + \frac{1}{2}(9,8)(0,2)^2$✓
$\Delta y =$ - 0,196 m

Height/ *Hoogte* = -0,1,96 + (-30) ✓
= -30,196
= 30,196 m ✓

(4)

3.6 **Marking criteria**

- Correct formula to calculate v_i: $\Delta y = v_i\Delta t + \frac{1}{2}g\Delta t^2$ / or any Δy formula
- Correct substitution into the formula leading to the answer
- Final answer of 2,68 s

Kriteria vir die nasien

- *Korrekte formule om v_i te bereken: $\Delta y = v_i\Delta t + \frac{1}{2}g\Delta t^2$ / of enige Δy-formule*
- *Korrekte vervanging in die formule wat tot die antwoord lei*
- *Finale antwoord van 2,68 s*

POSITIVE MARKING FROM QUESTION 3.4 AND QUESTION 3.5
POSITIEWE NASIEN UIT VRAAG 3.4 EN VRAAG 3.5

OPTION 1 / *OPSIE 1*

Whole motion / *Hele beweging*

$\Delta y = v_i\Delta t + \frac{1}{2}g\Delta t^2$✓
$30 = -1{,}96\Delta t + \frac{1}{2}(9{,}8)\Delta t^2$✓
$\Delta t = 2{,}68$ s✓

OPTION 2 / *OPSIE 2*

From maximum height / *Vanaf maksimum hoogte*

$\Delta y = v_i\Delta t + \frac{1}{2}g\Delta t^2$✓
$30{,}196 = 0\Delta t + \frac{1}{2}(9{,}8)\Delta t^2$✓
$\Delta t = 2{,}48$
$\Delta t = 2{,}48 + 0{,}2$
$\Delta t = 2{,}48$ s✓

OPTION 3 / *OPSIE 3*

From point of launch downwards
Vanaf die punt van lansering

$\Delta y = v_i\Delta t + \frac{1}{2}g\Delta t^2$✓
$30 = 1{,}96\Delta t + \frac{1}{2}(9{,}8)\Delta t^2$✓
$\Delta t = 2{,}28$
$\Delta t = 2{,}28 + 0{,}4$
$\Delta t = 2{,}68$ s✓

(3)

3.7 **Marking criteria**

- Correct formula to calculate v_f: $v_f = v_i + g\Delta t$ / $\Delta y = v_i\Delta t + \frac{1}{2}g\Delta t^2$ or any Δy formula
- Correct substitution into the formula leading to the answer
- Final answer of 2,68 s

Kriteria vir die nasien

- *Korrekte formule om v_f te bereken: $v_f = v_i + g\Delta t$ / $\Delta y = v_i\Delta t + \frac{1}{2}g\Delta t^2$ of enige Δy-formule*
- *Korrekte vervanging in die formule wat tot die antwoord lei*
- *Finale antwoord van 2,68 s*

POSITIVE MARKING FROM QUESTION 3.4 AND QUESTION 3.6
POSITIEWE NASIEN UIT VRAAG 3.4 EN VRAAG 3.6

OPTION 1 / *OPSIE 1*
Whole motion
Hele beweging

$v_f = v_i + g\Delta t$✓
$= -1{,}96 + 9{,}8(2{,}68)$✓
$= 24{,}304\ m \cdot s^{-1}$✓
OR
$v_f^2 = v_i^2 + 2g\Delta y$
$= (-1{,}96)^2 + 2(9{,}8)(30)$
$= 24{,}33\ m \cdot s^{-1}$
OR
$\Delta y = \left(\frac{v_f + v_i}{2}\right)\Delta t$
$30 = \left(\frac{v_f - 1{,}96}{2}\right)(2{,}68)$
$v_f = 24{,}35\ m \cdot s^{-1}$

OPTION 2 / *OPSIE 2*
Maximum height
Maksimum hoogte

$v_f = v_i + g\Delta t$✓
$= 0 + 9{,}8(2{,}48)$✓
$= 24{,}304\ m \cdot s^{-1}$✓
OR
$v_f^2 = v_i^2 + 2g\Delta y$
$= 0^2 + 2(9{,}8)(30{,}196)$
$= 24{,}33\ m \cdot s^{-1}$
OR
$\Delta y = \left(\frac{v_f + v_i}{2}\right)\Delta t$
$30{,}196 = \left(\frac{v_f + 0}{2}\right)(2{,}48)$
$v_f = 24{,}35\ m \cdot s^{-1}$

OPTION 3 / *OPSIE 3*
Point of launch
Punt van lansering

$v_f = v_i + g\Delta t$✓
$= 1{,}96 + 9{,}8(2{,}28)$✓
$= 24{,}304\ m \cdot s^{-1}$✓
OR
$v_f^2 = v_i^2 + 2g\Delta y$
$= (1{,}96)^2 + 2(9{,}8)(30)$
$= 24{,}33\ m \cdot s^{-1}$
OR
$\Delta y = \left(\frac{v_f + v_i}{2}\right)\Delta t$
$30{,}196 = \left(\frac{v_f + 0}{2}\right)(2{,}48)$
$v_f = 24{,}355\ m \cdot s^{-1}$

Range: 24,30 m·s^{-1} to / *tot* 24,36 m·s^{-1}

3.8 **Marking criteria**

- Correct formula to calculate v_f: $v_f^2 = v_i^2 + 2g\Delta y$
- Correct substitution of v_i and Δy into the formula leading to the answer
- Final answer of 18,88 m·s^{-1}

Kriteria vir die nasien

- *Korrekte formule om v_f te bereken: $v_f^2 = v_i^2 + 2g\Delta y$*
- *Korrekte vervanging van v_i en Δy in die formule wat tot die antwoord lei*
- *Finale antwoord van 18,88 m·s^{-1}*

POSITIVE MARKING FROM QUESTION 3.4 AND QUESTION 3.7
POSITIEWE NASIEN UIT VRAAG 3.3 EN VRAAG 3.7

OPTION 1 / *OPSIE 1*

Whole motion / *Hele beweging*

$v_f^2 = v_i^2 + 2g\Delta y$✓
$= (-1{,}96)^2 + 2(9{,}8)(18)$✓
$v_f = 18{,}88\ m \cdot s^{-1}$✓

OPTION 2 / *OPSIE 2*

Point of launch / *Punt van lansering*

$v_f^2 = v_i^2 + 2g\Delta y$✓
$= (1{,}96)^2 + 2(9{,}8)(18)$✓
$v_f = 18{,}88\ m \cdot s^{-1}$✓

OPTION 3 / *OPSIE 3*

Maximum height / *Maksimum hoogte*

$v_f^2 = v_i^2 + 2g\Delta y$✓
$= (0)^2 + 2(9{,}8)(18{,}196)$✓
$v_f = 18{,}885\ m \cdot s^{-1}$✓

OPTION 4 / *OPSIE 4*

From the ground / *Vanaf die grond*

$v_f^2 = v_i^2 + 2g\Delta y$✓
$(24{,}304)^2 = v_i^2 + 2(9{,}8)(12)$✓
$v_f = 18{,}85\ m \cdot s^{-1}$✓

(3)

Range 18,85 m·s^{-1} to / *na* 18,93 m·s^{-1}

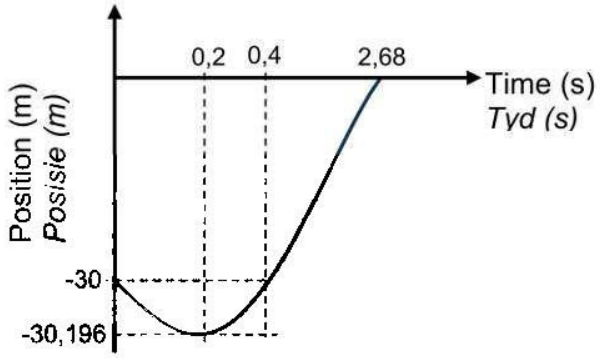
3.8 **Marking criteria**

- Indicating the value of 30,196 m and 0,2 s
- Indicating 30 m and 0 s or 0,4 s
- Correct shape of the graph (parabolic)
- Correct labels of both x and y axes.

Kriteria vir die nasien

- *Dui die waarde van 30,196 m en 0,2 s aan*
- *Dui 30 m en 0 s of 0,4 s aan*
- *Korrekte vorm van die grafiek (parabolies)*
- *Korrekte byskrifte van beide x- en y-as.*

POSITIVE MARKING FROM QUESTION 3.4
POSITIEWE NASIEN UIT VRAAG 3.4



(4)
[24]

QUESTION/*VRAAG* 4

4.1.1 The net 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 krag wat op 'n voorwerp inwerk, is gelyk aan die tempo van verandering van momentum van die voorwerp in die rigting van die netto krag. ✓✓ ***(2 of 0)*** (2)

4.1.2 True ✓
Change in momentum is zero / Car is moving at constant velocity. ✓✓ (3)
Waar ✓
Verandering in momentum is nul / Motor beweeg teen konstante snelheid. ✓✓

4.1.3

OPTION 1 / *OPSIE 1* **East positive / *Ooswaarts positief***	**OPTION 2 / *OPSIE 2*** **East positive / *Ooswaarts positief***
Σp(before / *voor*) = Σp(after / *na*) $p_{icar/motor} + p_{ibakkie} = p_{fcar/motor} + p_{fbakkie}$ ✓ -12 495 + 12 753 ✓= 6867 + $p_{fbakkie}$✓ $p_{fbakkie}$ = - 6 609 = 6 609 kgm·s^{-1}, west / *wes* ✓	$\Delta p_{car/motor} = - \Delta p_{bakkie}$✓ 6 867 – (–12 495)✓ = 12 753 - p_f✓ 6 609 = – $p_{fbakkie}$ $p_{fbakkie}$ = – 6 609 = 6 609 kgm·s^{-1}, west / *wes* ✓

(4)

4.1.4 **Marking criteria**

- Correct formula to calculate F_{net}: $F_{net} = \frac{\Delta p}{\Delta t}$
- Correct substitution into the formula leading to the answer
- Final answer of 1,94x10^5 N west

Kriteria vir die nasien

- *Korrekte formule om F_{net} te bereken: $F_{net} = \frac{\Delta p}{\Delta t}$*
- *Korrekte vervanging in die formule wat tot die antwoord lei*
- *Finale antwoord van 1,94x10^5 N wes*

POSITIVE MARKING FROM QUESTION 4.1.3
POSITIEWE NASIEN UIT VRAAG 4.1.3

OPTION 1 / *OPSIE 1* - Bakkie	**OPTION 2 / *OPSIE 2* – Car / *Motor***
$F_{net} = \frac{\Delta p}{\Delta t}$ ✓ $= \frac{-6609 - 12\,753}{0,1}$ ✓ $= -1,936 \times 10^5$ $= 1,94 \times 10^5$ west/*wes*✓	$F_{net} = \frac{\Delta p}{\Delta t}$ $= \frac{6867 - (-12\,495)}{0,1}$ ✓ $= 1,936 \times 10^5$ $= 1,9410^5$ west/*wes*✓

(3)

4.1.5 1,94x10^5 east / *oos*✓ (1)

4.2.1 (U + k)A = (u + K)C
mgh + ½mv^2 = mgh + ½mv^2 Any/*Enige* ✓
12× 9,8 ×5 + 0✓ = 0 + ½×12v^2✓
v = 6,26 m·s^{-1}✓ (4)

4.2.2 ME at / *by* B = Total ME of the pendulum at A – energy gained by crate
Totale ME van die pendulum by A – energie verkry deur krat

$= mgh + ½mv^2 - ½mv^2$
$= 12 \times 9,8 \times 5 + 0$✓ $- ½ \times 4(2)^2$ ✓
$= 588 – 8$
$= 580$ J
$580 = mgh + ½mv^2$ ✓
$= 12 \times 9,8 \times 1 + ½ \times 12v^2$
$v = 8,78$ m·s^{-1}
$p = mv$ ✓
$= (12(8,78)$ ✓
$= 105,36$ kgm·s^{-1}✓ (6)
[22]

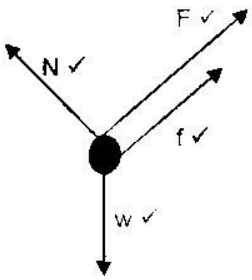
QUESTION/*VRAAG* 5

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

5.1.2 Negative/*Negatief* ✓ (1)

5.1.3 *Spanningskrag* ✓ *en wrywingskrag.* ✓ (2)

5.1.4



Accept the following symbols / *Aanvaar die volgende simbole*		
w	F_g /mg/weight/*gewig*	✓
f	f_k/Friction/*wrywing*/frictional force/*wrywingskrag*/kinetic frictional force/*kinetiese wrywingskrag*	✓
N	FN / Normal / Normaal / Normal force / *Normaalkrag*	✓
F	T/Force applied/Tension/FT/Force on the rope / *Krag op die tou*	✓

(4)

5.1.5 The work done on an object by a net force is equal to the change in the object's kinetic energy. ✓✓
Die arbeid wat deur 'n netto krag op 'n voorwerp verrig word, is gelyk aan die verandering in die voorwerp se kinetiese energie. ✓✓ *(2)*

OPTION 1 / *OPSIE 1*

$W_{net} = \Delta K$
$W_F + W_f + W_{Fg//} = \Delta K$
$F\Delta x\cos\theta + f\Delta x\cos\theta + mg\sin\theta\Delta x\cos\theta = \Delta K$ } Any / *Enigeen* ✓

$\underline{F(24,29)\cos 180°} + \underline{20,79(24,29)\cos 180°} + 60x9,8\left(\frac{8,6}{24,29}\right)24,29\cos 0° = 0$

$F = 187,39$ N ✓

OPTION 2 / *OPSIE 2*

$W_{nc} = \Delta K + \Delta U$
$W_F + W_f + = \Delta K + \Delta U$
$F\Delta x\cos\theta + f\Delta x\cos\theta = \frac{1}{2}m\left(v_f^2 - v_i^2\right) + mg\left(h_f - h_i\right)$ } Any / *Enigeen* ✓

$\underline{F(24,29)\cos 180°} + \underline{20,79(24,29)\cos 180°} = 0 + 60 \times 9,8(0 - 8,6)$

$F = 187,39$ N ✓

(6)

5.2

$$P = \frac{W}{\Delta t} = \frac{mgh - 0}{\Delta t}$$ Any/*enige* ✓

$$= \frac{400 \times 9,8 \times 5,6}{4}$$ ✓

$= 5\,488$ W ✓

(3)
[20]

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 (oënskynlike) verandering in frekwensie (of toonhoogte) van die klank (waargeneem deur 'n luisteraar)* ✓*omdat die klankbron en die luisteraar verskillende snelhede het relatief tot die medium van klankvoortplanting.* ✓

OR/*OF*

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

(2)

6.2 $f_L = \left(\frac{v \pm v_L}{v \pm v_s}\right) f_s$ ✓ *or* $f_L = \left(\frac{v}{v - v_s}\right) f_s$

615 ✓ $= \frac{330}{330 - v_s} \times 500$ ✓

$v_s = 61{,}71\ m \cdot s^{-1}$ ✓ (4)

6.3 **POSITIVE MARKING FROM QUESTION 6.2**
POSITIEWE NASIEN UIT VRAAG 6.2

$$v = \frac{d}{\Delta t} \checkmark$$

$$61{,}71 = \frac{30{,}85}{\Delta t} \checkmark$$

$$\Delta t = 0{,}499\ s \checkmark$$

(3)

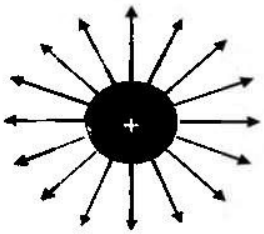
6.4.1 Away from / *Weg van* ✓
A lower frequency is detected.✓ The spectral lines are shifted to the red end of the spectrum. ✓
Laer frekwensie word waargeneem.✓ Die spektraallyne word na die rooikant van die spektrum verskuif. ✓ (3)

6.4.1 Universe is expanding / *Die heelal word groter/brei uit* ✓ (1)
[13]

QUESTION/*VRAAG* 7

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

7.2

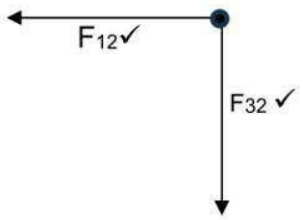


Criteria for sketch / *Kriteria vir skets*	
Correct direction *Korrekte rigting*	✓
Correct shape (radial) *Korrekte vorm*	✓

(2)

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

7.4



(2)

7.5 $F_{12} = \frac{k\,Q_1 Q_2}{r^2}$ ✓

$= \frac{9 \times 10^9 \times (100 \times 10^{-6})(100 \times 10^{-6})}{(3 \times 10^{-2})^2}$ ✓

$= 1 \times 10^5$ N ✓

(3)

7.6 **POSITIVE MARKING FROM QUESTION 7.5**
POSITIEWE NASIEN UIT VRAAG 7.5

$F_{32} = \frac{kQ_3Q_2}{r^2}$

$= \frac{9 \times 10^9 \times (100 \times 10^{-6})Q_3}{(3 \times 10^{-2})^2}$ ✓

$= Q_3 \times 10^9 N$

$(F_{net})^2 = (F_{12})^2 + (F_{32})^2$ ✓

$(1{,}41 \times 10^5)^2 = (1 \times 10^5)^2 + (Q_3 \times 10^9)^2$ ✓

$Q_3 = 9{,}88 \times 10^{-9}$C ✓

(4)
[15]

QUESTION/*VRAAG* 8

8.1 3,11 J ✓of energy is transferred per one coulomb of charge. ✓
3,11 J ✓van energie word oorgedra per een coulomb lading. ✓ *(2)*

8.2.1

OPTION 1 / *OPSIE 1*

$V = IR_2$
$1{,}6 = 0{,}2R_2$ ✓
$R_2 = 8\Omega$
$V = IR$
$= 0{,}2(4 + 8)$ ✓
$= 2{,}4$ V ✓

Any / *Enigeen* ✓

OPTION 2 / *OPSIE 2*

$V_{Ext} = V_{4\Omega} + V_{R_2}$
$= IR_1 + V_2$
$= 0{,}2(4)$ ✓ $+ 1{,}6$ ✓
$= 2{,}4\,V$ ✓

Any / *Enigeen* ✓

(4)

8.2.2

OPTION 1 / *OPSIE 1*	**OPTION 2 / *OPSIE 2***	**OPTION 3 / *OPSIE 3***
V = IR 2,4 = I(2)✓ I =1,2 A I_{Total} = 1,2 + 2✓ = 1,4 A✓	$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2}$ $= \frac{1}{2} + \frac{1}{4+8}$ ✓ $R_p = 1{,}71\ \Omega$ $V_p = I_p R_p$ $2{,}4 = I_p(1{,}71)$ ✓ $I_p = 1{,}4\ A$✓	Ratios Resistance: R1 : R2 *Weerstandverhouding* 6 : 1✓ Current:1 : 6 = 7(0,2) ✓ = 1,4 A✓

(3)

8.2.3 **POSITIVE MARKING FROM QUESTIONS 8.2.1 AND 8.2.2**
POSITIEWE NASIEN UIT VRAE 8.2.1 EN 8.2.2

OPTION 1 / *OPSIE 1*	**OPTION 2 / *OPSIE 2***
$\varepsilon = I(R + r)$ $3{,}11$✓$= 1{,}4(1{,}71 + r)$✓ $r = 0{,}51\ \Omega$✓	$V_{lost} = \varepsilon - V_{ext}$ $= 3{,}11 - 2{,}4$✓ $= 0{,}71$ $V_{lost} = Ir$ $0{,}71 = 1{,}4r$✓ $r = 0{,}51\ \Omega$✓

(3)

8.2.4

OPTION 1 / *OPSIE 1*	**OPTION 2 / *OPSIE 2***	**OPTION 3 / *OPSIE 3***
P = VI✓ = 0,714(1,4) ✓ = 0,9966 W✓	P = I^2R✓ = $(1,4)^2(0,51)$ ✓ = 0.9996 W✓	$P = \frac{V^2}{R}$ ✓ $= \frac{(0,714)^2}{0,51}$✓ $= 0{,}9996\ W$✓

(3)
[15]

GRAND TOTAL: / *GROOTTOTAAL*: 150