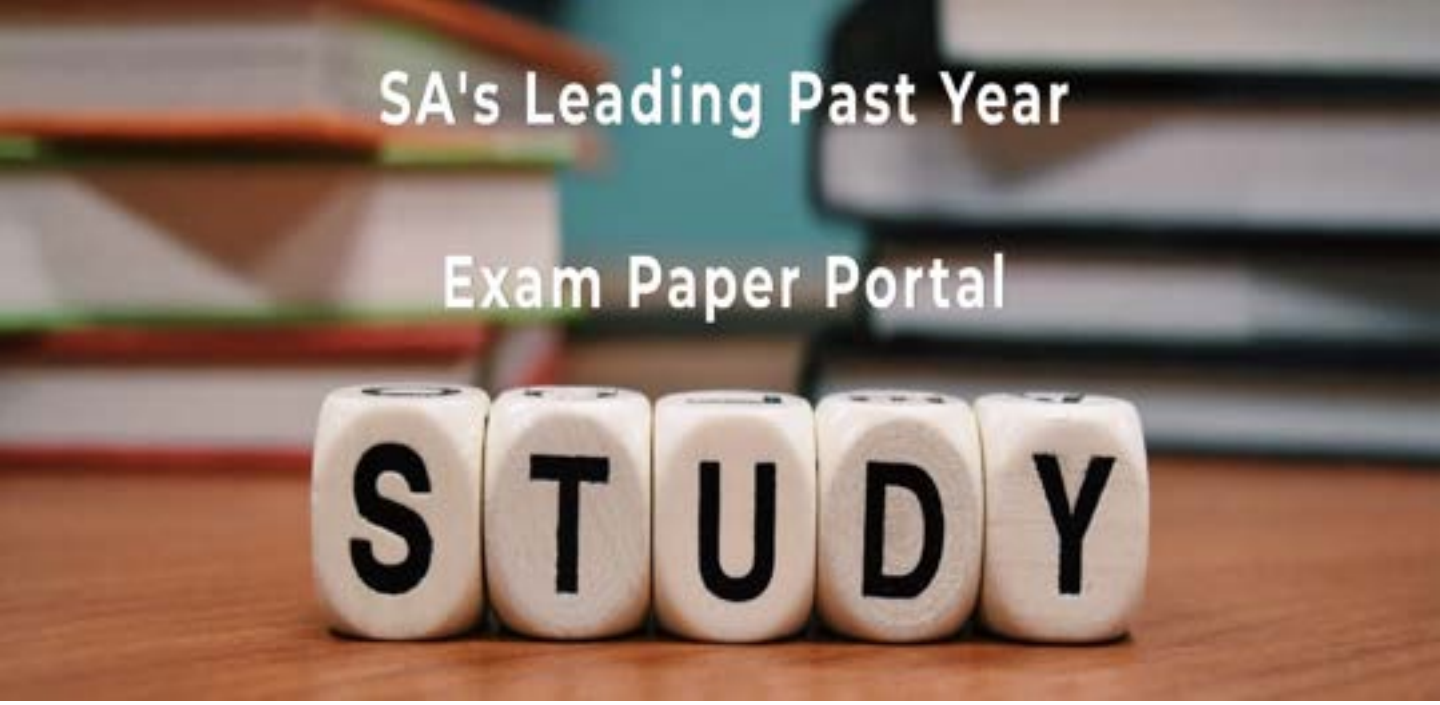


GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PREPARATORY EXAMINATION/ *VOORBEREIDENDE EKSAMEN*

2022

MARKING GUIDELINES/ *NASIENRIGLYNE*

10841

PHYSICAL SCIENCES: PHYSICS/
FISIESE WETENSKAPPE: FISIKA

PAPER/*VRAESTEL* 1

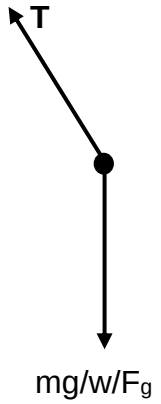
21 pages/*bladsye*

QUESTION/*VRAAG* 1

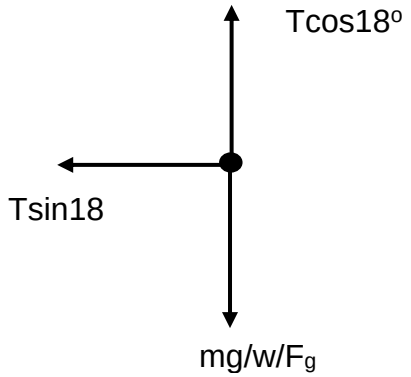
1.1	C	✓✓	(2)
1.2	B	✓✓	(2)
1.3	D	✓✓	(2)
1.4	B	✓✓	(2)
1.5	B	✓✓	(2)
1.6	A	✓✓	(2)
1.7	D	✓✓	(2)
1.8	D	✓✓	(2)
1.9	A	✓✓	(2)
1.10		**Accept any answer. All answers correct. If learner gives no answer, allocate two marks as well.** ✓✓	(2)
		(10 x 2)	**[20]**

QUESTION/*VRAAG* 2

2.1

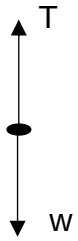


OR/*OF*



If learner does free body diagram vertically up and down, also accept the answer. Question did not stipulate in which position the ball was.

Indien leerder vryliggaamdiagram op en af teken, aanvaar. Vraag het nie posisie van bal aangedui nie.



Marking Guidelines:	***Nasienriglyne:***
✓ for each force with label Arrow with line	✓*vir elke krag met 'n byskrif*

(2)

2.2 2.2.1 **OPTION/*OPSIE* 1**

$F_g = mg$ ✓
$= 0,05 \times 9,8$ ✓
$= 0,49$ N

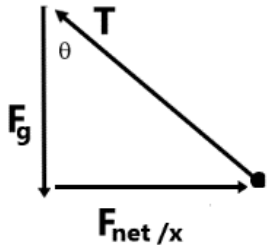
$\tan\theta = \frac{F_x}{F_g}$
$\tan 18° = F_x \div 0,49$ ✓
$F_x = 0,159$ N ✓

Marking Guidelines:/ *Nasienriglyne:*
✓ Formula
✓ $F_g = 0,49$ N (substitution)
✓ Trig calculation/*trigonometrie bewerking*
✓ Answer: $F_y = 0,159$ N
Antwoord: $F_y = 0,159$ N

OPTION/*OPSIE* 2

$T\cos 18° = mg$ ✓
$T \cos 18° = 0,05 \times 9,8$ ✓
$T = 0,5152$N

$F_x = T \sin 18°$
$= 0,5152 \times \sin 18°$ ✓
$= 0,1592$N ✓



(4)

2.2.2 $F_{net} = ma$ ✓
$\underline{0,159 = 0,05} \times a$ ✓
$a = 3,1842$ m.s^{-2} ✓

If carried over 0,16 instead of 0,159
Final answer 3,2 m.s^{-2}
Learner gets full marks if calculation is correct.

Marking Guideline:
Positive marking from 2.2.1
✓ $F_{net} = ma$
✓ Substitution
✓ Final answer

Nasienriglyne:
Positiewe nasien vanaf 2.2.1
✓ *$F_{net} = ma$*
✓ *Invervanging*
✓ *Finale antwoord*

(3)

2.3 2.3.1 $F_{netA} = ma$ ✓ $= +T - f_{kA}$
$5 \times 2,17 = +26 - f_{kA}$ ✓
$f_{kA} = 15,15$ N ✓
$F_{netB} = ma = +F_x - T - f_{kB}$
$5 \times 2,17 = +(65 \times \cos 40°) - 26 - f_{kB}$ ✓
$f_{kB} = 12,94$ N ✓
✓ Formula
✓ Whole substitution
✓ Answer
✓ Whole substitution
✓ Answer

(5)

2.3.2 $f_k = \mu_k \text{N}$
μ_k is a constant for a specific surface. ✓ The surfaces can differ.
Force (Block B) at an angle will decrease the normal force. ✓
Normal force is directly proportional to the kinetic frictional force, thus if the normal force decreases then the frictional force will decrease. ✓

$f_k = \mu_k \text{N}$
μ_k is 'n konstante vir 'n spesifieke oppervlakte. ✓*Die oppervlaktes kan verskil. Krag (Blok B) teen 'n hoek sal die normaalkrag verminder.* ✓
Normaalkrag is direk eweredig aan die kinetiese wrywingskrag, dus indien die normaalkrag verminder dan sal die wrywingskrag verminder. ✓ (3)

[17]

QUESTION/*VRAAG* 3

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

OR/*OF*

Moving body where the only force acting on the object is the force of gravity
Bewegende liggaam waar die enigste krag wat op die voorwerp inwerk, gravitasiekrag is

Marking criteria/*Nasienriglyne*
If any of the underlined words/phrases in the correct context is omitted deduct 1 mark./ *Indien enige van die onderstreepte woorde/frases in die korrekte konteks uitgelaat is, trek 1 punt af.*

(2)

3.2 3,43 m.s^{-1}. ✓ penalise if there is no unit / *penaliseer indien geen eenheid* (1)

3.3

NOTE: ACCEPTED LABELS/ *AANVAARDE BYSKRIFTE*		MARK/ *PUNT*
w	F_g/F_w/weight/0,49N/gravitational force	✓✓

Notes:/*Notas:*

- Mark awarded for label and arrow./*Ken punt toe vir byskrif en pyl.*
- Do not penalise for length of arrows, drawing is not to scale./*Moenie penaliseer vir lengte van pyle, nie op skaal geteken nie.*
- Any other additional force(s) Max. ½ /*Enige ander addisionele kragte Max. ½*
- If force(s) do not make contact with body. Max. ½ /*Indien krag nie kontak maak met kol nie Maks ½*
- If no arrows indicated and all forces correctly drawn deduct 1 mark./*Indien geen pyle nie maar alle kragte korrek getrek is, trek een punt af* (2)

3.4 3.4.1 **OPTION/*OPSIE* 1**

Gradient/*Gradiënt* = acceleration/*versnelling* = $\frac{\Delta y}{\Delta x}$

$= \frac{3,92 - 0}{0,4}$ ✓ ✓

$= 9,8\ m.s^{-2}$ ✓

OPTION/*OPSIE* 2

Gradient/*Gradiënt* = acceleration/*versnelling* = $\frac{\Delta y}{\Delta x}$

$= \frac{3,43 - 0}{0,77 - 0,42}$ ✓ ✓

$= 9,8\ m.s^{-2}$ ✓

OPTION/*OPSIE* 3

$v_f = v_i + a\Delta t$

3,92✓ = 0 + a(0,40) ✓

a = 9,8 $m.s^{-2}$ ✓

any equation of motion can be used (3)

Option 4

If learner uses the values for the collision during the 0,02 seconds when the ball is in contact with the ground.

$v_f = v_i + a\Delta t$

-3,43 ✓ = +3,92 + a(0,02)✓

a = -367,5 $m.s^{-2}$

Answer will be 367,5 $m.s^{-2}$ ✓

Give learner the credit if following this path and doing the correct science and calculations. (3)

3.4.2 **OPTION/*OPSIE* 1**

Height/*Hoogte* = area under the graph/ *area onder die grafiek*
= ½ bh ✓
= ½ x 0,4 x 3,92✓✓
= 0,784 m ✓
Do not penalise if formula is not given

OPTION/*OPSIE* 2

$y = v_i t + ½ gt^2$ ✓
= 0✓ + ½ (9,8)(0,4)^2✓
= 0,784 m ✓

OPTION/*OPSIE* 3

Downwards as positive/*Afwaarts as positief*

$v_f^2 = v_i^2 + 2ay$ ✓
3,92^2 ✓ = 0 + 2 x (9,8)y ✓
y = 0,784 m (downwards/*afwaarts*) ✓

(4)

OPTION/*OPSIE* 4

Downwards as negative/*Afwaarts as negatief*

$v_f^2 = v_i^2 + 2a\Delta y$✓

(-3,92)^2 ✓= (0)^2 + 2(-9,8) Δy✓

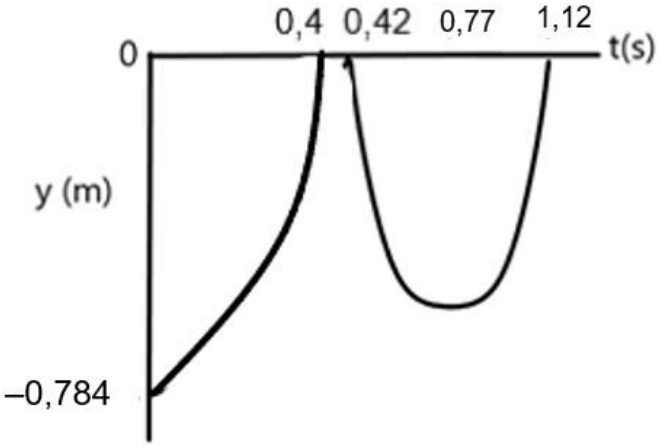
∴ Δy = -0,784 m
∴ Δy = 0,784 m downwards/*afwaarts*
The height from which the ball was dropped = 0,784 m.✓
Die hoogte waarvan dan die bal laat val is = 0,784 m.

OPTION/*OPSIE* 5

$y = \left(\frac{v_f + v_i}{2}\right) t$✓
$= \left(\frac{3,92 + 0}{2}\right)$ ✓0,4✓

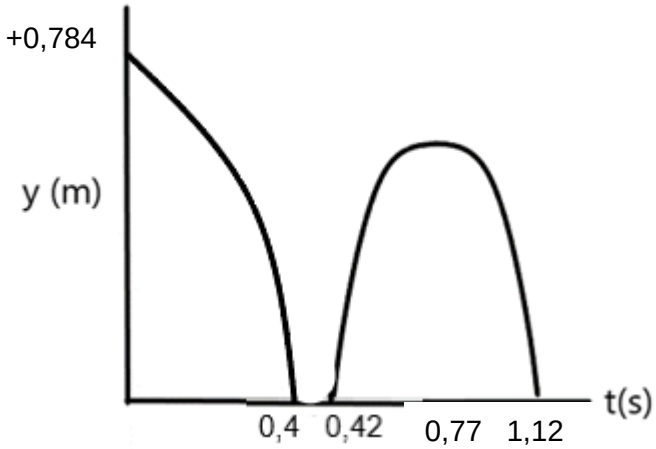
= 0,784 m✓

3.5 **(Downwards taken as positive)/*(afwaarts geneem as positief)***
positive marking on the height / positiewe nasien vir die hoogte



OR/*OF*

(Downward taken as negative)/*(Afwaarts geneem as negatief)*
positive marking on the height / positiewe nasien vir die hoogte



Marking Criteria/*Nasienriglyne*	**Mark/*Punt***
Graph starting from the maximum height (0,784 m) *Grafiek begin vanaf maksimum hoogte (0,784 m)*	✓
Time taken to reach the ground indicated *Tyd geneem om grond te bereik aangedui*	✓
Correct shape of the graph/*Korrekte vorm van grafiek*	✓
Ground taken as zero/*Grond geneem as nulverwysing*	✓

(4)

3.6 Net force/resultant force. ✓✓
Netto krag/resultante krag (2)

3.7 $F_{net} = Fg + Ffloor$ ✓

$-18{,}375 = 0{,}49 + F_{floor}$ ✓

$F_{net} = 18{,}865$ N ✓
Rounding-off will have to be 18,87 N./*Afronding sal 18,87 N moet wees.*
Minus must not be in the final answer. (3)

3.8 DECREASES ✓
$F_{net}\,\Delta t = \Delta p$ formula refers to proportionality – allocate marks.
If the change in momentum remains constant,
the <u>net force is inversely proportional to the time of contact</u>.✓
Thus, if the <u>time increases</u> the net force will decrease. ✓

AFNEEM ✓
$F_{net}\,\Delta t = \Delta p$
Indien die verandering in momentum konstant bly,
is die <u>netto krag omgekeerd eweredig aan die kontaktyd.</u> ✓
Dus, indien <u>die tyd vermeerder</u> sal die netto krag verminder. ✓ (3)
[24]

QUESTION/*VRAAG* 4

4.1 A force for which the work done in moving an object between two points is independent of the path taken. ✓✓
'n Krag waarvoor die arbeid verrig om die voorwerp te beweeg tussen twee punte onafhanklik is van die pad wat geneem word.

Marking criteria/*Nasienriglyne*

If any of the underlined words/phrases in the correct context is omitted, deduct 1 mark. If the word work is omitted, zero marks.
Indien enige van die onderstreepte woorde/frases in die korrekte konteks uitgelaat is, trek 1 punt af. Indien die woord arbeid weggelaat is, geen punte.

(2)

4.2 Force of gravity **OR** Gravitational force ✓/
*Gravitasiekrag **OF** swaartekrag* (1)

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

OR/*OF*

The work done on an object by a net force is equal to the change in the object's kinetic energy. ✓✓/
Die arbeid verrig op 'n voorwerp deur 'n netto krag is gelyk aan die verandering in kinetiese energie van die voorwerp.

Marking criteria/*Nasienriglyne*
If any of the underlined words/phrases in the correct context is omitted, deduct 1 mark.
Indien enige van die onderstreepte woorde/frases in die korrekte konteks uitegelaat is, trek een punt af.

(2)

4.4 **OPTION/*OPSIE* 1**
Change substitution. K together.
Formula Left right answer

Wnc = ΔK + ΔU ✓
$f_k \,.\Delta x.\, cos180°$ = (½ mv^2- ½ mv^2) + (mgh - mgh)
$f_k\, x\, (-8)$✓ = ½(2)6,92^2 - ½(2) 2^2 + 0 – 2(9,8)(8)sin 30 ° ✓
$f_k\, x\, (-8)$ = -34,5136
f_k = 4,3142 N
f_k = 4,31 N ✓

(4)

OPTION/*OPSIE* 2

$h = 8\sin 30 = 4m$
$W_{nc} = \Delta E_k + \Delta E_p$ ✓
$\Delta E_k = \Delta E_{kf} - \Delta E_{ki}$
= ½ (2) 6,92^2 – ½ (2) 2^2 ✓ this mark goes for both substitutions
= 43,886 J
$\Delta E_p = \Delta E_{pf} - \Delta E_{pi}$
= 2(9,8)0 - 2(9,8)4
= -78,4 J
$W_{nc} = \Delta E_k + \Delta E_p$
= 43,886 – 78,4
= -34,514 J
$f\Delta x \cos 180$✓ $= -34{,}514$
f = 4,31 N ✓

OPTION/*OPSIE* 3

$W_{net} = F_{net}\cos\theta = \Delta Ek$ ✓ either or
F_{net} (8)cos 0° = ½ mv_f^2 - ½ m v_i^2
8F = ½ (2)6,92^2 - ½ (2) 2^2 ✓
F_{net} = 5,486 N
F_{net} = + $Fg_{//}$ - f
5,486 = (2)(9,8)sin 30° - f ✓
f = 4,31 N ✓

4.5 **OPTION/*OPSIE* 1**

$W_{net} = f_k.x.cos\theta = \Delta E_k$ ✓
(0,35(2)9,8)cos180° ✓= 0 - ½ (2)(6,92^2) ✓
- 6,86 x = - 47,8864
x = 6,981 m ✓

OPTION/*OPSIE* 2

$f\Delta x\cos\theta = \Delta E_k$✓
$\mu_K\, x\, cos\theta = E_{kf} - E_i$
0,35(2)(9,8) $\Delta x \cos 180°$ ✓ = ½ (2)0^2 - ½ (2)(6,92^2)✓
$x = 6{,}98\, m$ ✓

(4)
[13]

QUESTION/*VRAAG 5*

5.1 5.1.1 Change in frequency observed or frequency received/The speed of the race car ✓✓
Frequency of listener as observed by the phone.
Verandering in frekwensie waargeneem of frekwensie ontvang/Die spoed van die renmotor
Frekwensie van luisteraar soos waargeneem deur die foon. (2)

5.1.2 Speed of sound in air ✓✓/stationary listener/siren set at 200 Hz
Spoed van klank in lug/ stilstaande luisteraar/sirene gestel op 200 Hz (2)

5.1.3 What is the relationship between the change in the frequency that will be heard relative to the speed of the vehicle? ✓✓
Wat is die verwantskap tussen die verandering in die frekwensie wat gehoor sal word relatief tot die spoed van die voertuig?

OR/*OF*

How can the speed of the race car be determined using the change in the frequency and the relative motion between the observer and the source? ✓✓
Hoe kan die spoed van die renmotor bepaal word deur gebruik te maak van die verandering in die frekwensie en die relatiewe beweging tussen die waarnemer en die bron?

Marking criteria/*Nasienriglyne*
Refer to **change in frequency** and **relative motion/Doppler effect.**
*Verwys na **verandering in frekwensie** en **relatiewe beweging/Doppler effek.***
In context with Doppler and scenario given.
Starting with **Is/Do/Does/Will/Can** one mark if answer to question is yes or no.
*Begin sin met **Sal/Is/Kan** een punt indien antwoord vir vraag ja of nee is.*

(2)

5.2 **OPTION/*OPSIE* 1**

$f_L = \frac{v \pm v_L}{v \pm v_S} f_S$ ✓

TOWARDS/*NA*:

$f_L = \frac{340}{340 - v_s}$ ✓ $x\ 200$ ✓

Either or

AWAY/*WEG*:

$f_L = \frac{340}{340 + v_s}\ x\ 200$

$\Delta f = f_f - f_i$

-67,15 ✓ $= \frac{340}{340+v_s}\ x\ 200 - \frac{340}{340-v_s}\ x\ 200$

-67,15 $= 200\ \frac{340}{340+v_s} - \frac{340}{340-v_s}$

v = 57,02 m.s^{-1}. ✓

Marking guidelines/ *Nasienriglyne:*
- ✓ Formula/*Formule*
- ✓ Substitution towards/ *Invervanging na*
- ✓ Substitution away/ *Invervanging weg*
- ✓ Substitution change in/*Invervanging vir verandering*
- ✓ Answer/*Antwoord*

Range for answers. (55-57) (5)

OPTION/*OPSIE* 2

$f_L = \frac{v \pm v_L}{v \pm v_S} f_S$ ✓ $\Delta f = f_f - f_i$ $\Delta f = \frac{v \pm v_L}{v \pm v_S} f_S - \frac{v \pm v_L}{v \pm v_S} f_S$ (-)67,15 ✓ $= \frac{340}{340+v_S} x\ 200$ ✓ - $\frac{340}{340-340} x200$ ✓ v = 57,02 m.s^{-1}. ✓
Ignore negative in front of the 67,15 during marking.

OPTION 3
If learners add or subtract the 67,15 Hz from 200 Hz. They will only do one sum.
Give mark allocation as follows:
✓ formula
✓ ✓ ✓ substitution
✓ answer

$f_L = \frac{v \pm v_L}{v \pm v_S} x f_S$ ✓

TOWARDS/*NA*:
$267{,}15$ ✓ $= \frac{340}{340-v_s}$ ✓$x\ 200$✓
v_s = 85,46 m.s^{-1}✓

OR/*OF* if sum done as AWAY/*WEG*:

$$132{,}85 = \frac{340}{340 + v_s} x\ 200$$

v_s = 171,86 m.s^{-1}

5.3 **AWAY** ✓
The spectrum of the distant star moved towards the <u>longer wavelengths</u>/ lower frequencies, ✓thus stretching out the waves proving that it is moving away. ✓

WEG ✓
Die spektrum van die verafgeleë ster beweeg na die <u>langer golflengtes</u>/laer frekwensies, dus die uitrekking van die golwe bewys dat dit besig is om weg te beweeg. (3)

[14]

QUESTION/*VRAAG* 6

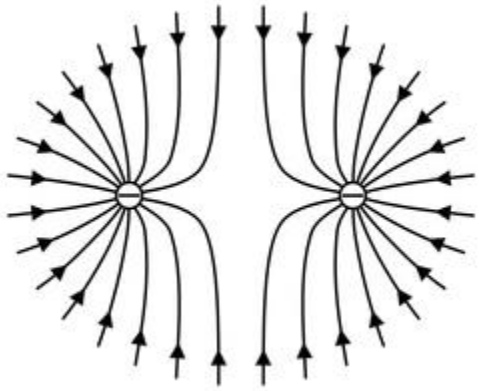
6.1 The electric field at a point is <u>the electrostatic force</u> experienced <u>per unit positive charge</u> placed at that point. ✓✓

Die elektriese veld by 'n punt in <u>die elektrostatiese krag</u> ondervind <u>per eenheid positiewe lading</u> geplaas by daardie punt.

2 marks or zero.

(2)

6.2



<u>Marking criteria/*Nasienriglyne*</u>

- ✓ Shape/form/ all lines need to be curved / *Vorm / alle lyne moet 'n kurwe hê.*
- ✓ Direction of arrows towards sphere/*Rigting van pyle na die sfere*
- ✓ All other field rules applied. / *Alle ander veldreëls toegepas.*

Do not penalise if different amounts of lines around the charges.
Ignore if different number of lines are drawn around each charge. / *Ignoreer indien die verskillende aantal lyne getrek is rondom elke lading.*

(3)

6.3 **OPTION/*OPSIE 1***

$F_{net\ on/op\ B} = F_{A\ on/op\ B} + F_{C\ on/op\ B}$

$F_{net\ on/op\ B} = \frac{kQ_A\ Q_B}{r^2} + \frac{kQ_C\ Q_B}{r^2}$ ✓

0,004078 ✓ $= \frac{9\ x\ 10^9\ x\ 5{,}6\ x\ 10^{-9}\ x\ 2{,}34\ x\ 10^{-9}}{0{,}006^2}$ ✓ $+ \frac{9\ x\ 10^9\ x\ 7{,}46\ x\ 10^{-9}\ x\ 2{,}34\ x\ 10^{-9}}{r^2}$ ✓

r = 0,01399 m (accept/*aanvaar* 0,014 m) ✓

(5)

OPTION/*OPSIE* 2

$F_{A\ on/op\ B} = \frac{kQ_A\ Q_B}{r^2}$ ✓

$= \frac{9\ x\ 10^9\ x\ 5{,}6\ x\ 10^{-9}\ x\ 2{,}34\ x\ 10^{-9}}{0{,}006^2}$ ✓

= 0,003276 N

$F_{C\ on/op\ B} = \frac{kQ_C\ Q_B}{r^2}$

$= \frac{9\ x\ 10^9\ x\ 7{,}46\ x\ 10^{-9}\ x\ 2{,}34\ x\ 10^{-9}}{r^2}$ ✓

$F_{C\ on/op\ B} = \frac{1{,}57\ x\ 10^{-7}}{r^2}$

$F_{net\ on/op\ B} = F_{A\ on/op\ B} + F_{C\ on/op\ B}$

0,004078 ✓= 0,003272 + $\frac{1{,}57\ x\ 10^{-7}}{r^2}$

r = 0,01399 m (accept/*aanvaar* 0,014 m) ✓

accept 0,01 m rounding off

6.4 6.4.1 $Q_{new/nuwe} = \frac{Q_A + Q_B}{2}$

$= \frac{+5{,}6 + (-2{,}34)}{2}$ ✓

= 1,63 nC

= 1,63 x 10^{-9} C ✓ accept either or (2)

6.4.2 <u>B is positively charged</u> ✓and <u>C negative</u>. <u>Attractive pattern</u>. ✓
The electric field pattern has changed. It is now originating from B and ending at C✓. This is because B is now positively charged whilst C remains negatively charged.

<u>B is positief gelaai</u> ✓en <u>C is negatief gelaai</u>. <u>Aantrekkende patroon</u>. ✓
Die elektriese veldpatroon het verander. Dit begin nou vanaf B en eindig by C ✓. Dit is omdat B nou positief gelaai is terwyl C negatief gelaai bly.

(3)

[15]

QUESTION/*VRAAG* 7

7.1 7.1.1 **OPTION/*OPSIE* 1**

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

$\frac{1}{R_p} = \frac{1}{30} + \frac{1}{10}$ ✓

$R_1 = \frac{15}{2}$

$= 7{,}5\ \Omega$

$R_T = R_s + R_p + r$

$= 7{,}5$✓ + $\underline{0{,}6 + 3{,}5}$ ✓ or (4,1)

$= 11{,}6\ \Omega$✓

Marking guidelines:/ *Nasienriglyne:*
- ✓ Formula R_T/*Formule R_T*
- ✓ Substitution/ *Invervanging*
- ✓ Formula R_T/ *Formule R_T*
- ✓ Substitution/ *Invervanging*
- ✓ Answer/*Antwoord*

OPTION/*OPSIE 2*

$R_T = R_s + R_p + r$ ✓

$= 3{,}5$ ✓ + $\frac{10 \times 30}{10+30}$ ✓ + 0,6 ✓

$= 11{,}6\ \Omega$✓

(5)

7.1.2 **OPTION/*OPSIE* 1**

$V_P = I \times R_P$

$= 2{,}07 \times 7{,}5$ ✓

$= 15{,}53$ V

$I_2 = \frac{V_P}{R}$

$= \frac{15{,}53}{10}$ ✓

$= 1{,}55$ A ✓

Marking guidelines:/ *Nasienriglyne:*
- ✓ ✓Substitution/ *Invervanging*
- ✓ Answer/ *Antwoord*

OPTION/*OPSIE* 2

RATIO 1 : 3 ✓

∴ ¾ : ¼

∴ 2,07 x ¾ ✓ = 1,55 A ✓

OPTION/*OPSIE* 3

$V_{//} = 24 - V_r - V_{ex}$

$= 24 - (2{,}06897 \times 0{,}6) - (2{,}06897 \times 3{,}5)$ ✓

$= 15{,}517$ V

$I_{A2} = \frac{V_{//}}{R_{heater/verwarmer}}$

$= \frac{15{,}517}{10}$ ✓

$= 1{,}55$ A ✓

(3)

7.2 DECREASES ✓

<u>Increasing R increases</u> the total resistance of the circuit, hence reduces the overall circuit current, ✓ This will reduce the reading on A_2 and from $P = I^2R$, heat dissipated reduces. ✓ (relationship between current and power)

VERLAAG ✓

Toename van R lei tot toename in totale weerstand van die stroom, daarom verminder die totale stroom van die stroombaan. Dit sal die lesing op A_2 verminder en vanaf $P=I^2r$, word hitte gelewer verminder.

OR/*OF*

I decreases or V decreases ✓*I I verminder of V verminder*

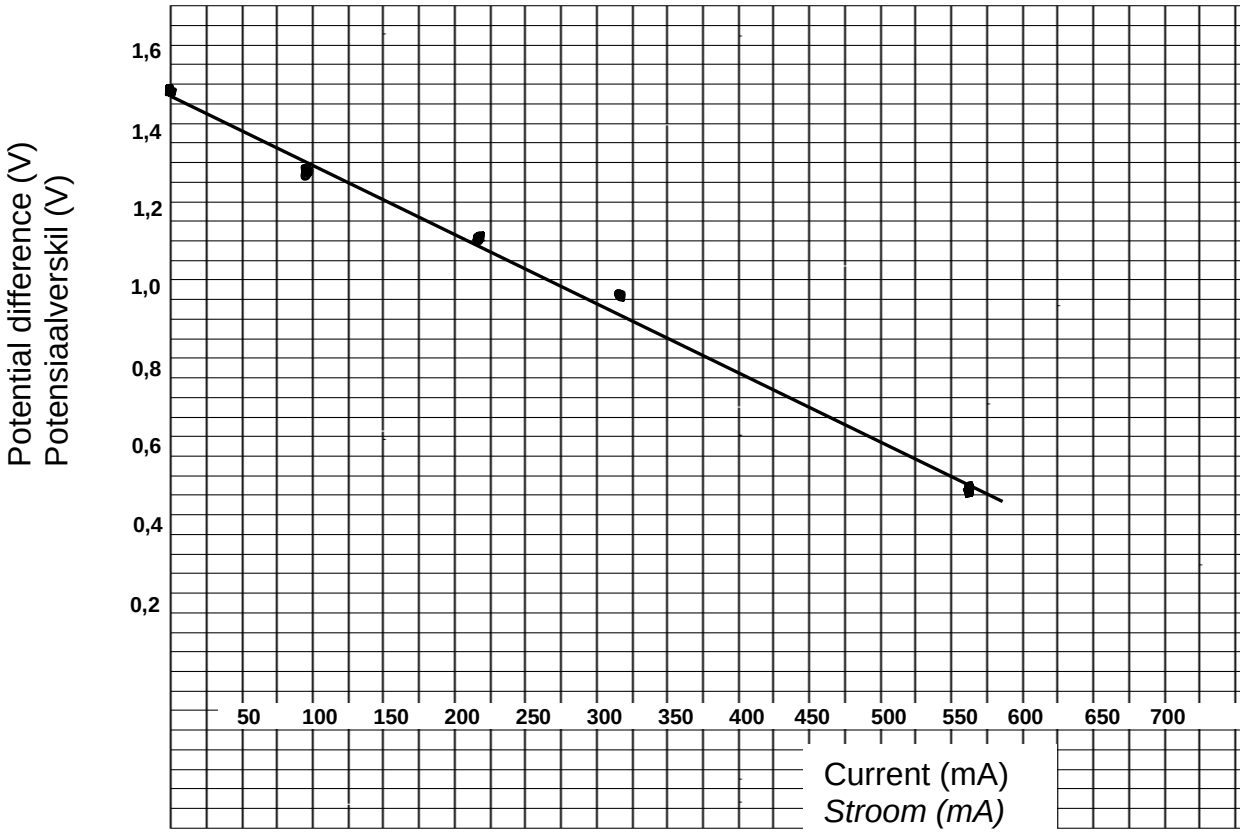
$P = I^2 R$ or $P = \frac{V^2}{R}$ ✓

∴ Less heat dissipated. ✓/*Minder hitte word versprei.* (3)

[11]

QUESTION/*VRAAG* 8

8.1



Marking Guidelines/*Nasienriglyne*:
- ✓ Calibration on both axes/*Intervalle op beide asse*
- ✓ 5 points plotted correctly/*5 punte korrek geplot*
- ✓ Close fit line through most of the points/*Beste paslyn deur die meeste punte*
- ✓ Negative gradient/*Negatiewe gradient*

Do not penalise for A in place of mA (4)

8.2 8.2.1 1,5 V ✓ (1)

8.2.2 gradient $= \frac{\Delta y}{\Delta x} = \frac{0{,}5-1{,}5✓}{652\ x\ 10^{-3} - 0✓}$ if learners swop final and initial do not penalise

= - 1,53 Ω

r = 1,53 Ω ✓ (can use any of the values from the table.)/*(enige waardes vanuit die tabel kan gebruik word)*

must have a positive as the answer (3)

8.3 INCREASES ✓

As the resistance decreases the current will increase. ✓

Resistance is inversely proportional to the current.

As the current increases, the temperature of the battery will increase due to an increase in total resistance since internal resistance stays the same.

✓(relationship between current and energy) $W = I^2R\Delta t$

VERHOOG ✓

Soos die weerstand verminder sal die stroom verhoog. ✓

Weerstand is omgekeerd eweredig aan die stroom.

Soos die stroom verhoog, verhoog die temperatuur van die battery as gevolg van die groter totale weerstand en die interne weerstand bly konstant. ✓

$W = I^2R\Delta t$ (3)

[11]

QUESTION/*VRAAG* 9

9.1 Electrical energy to mechanical energy/ ✓✓ 2 or zero
Elektriese energie na meganiese energie (2)

9.2 Direct current: The current keeps flowing in one direction only. ✓✓
Gelykstroom: Die stroom hou aan om slegs in een rigting te beweeg.

OR/*OF*

The current carrying charges move in only one direction. ✓✓
Die stroom wat ladings dra, beweeg net in een rigting.

Marking criteria/*Nasienriglyne:*

If any of the underlined words/phrases in the correct context is omitted, deduct 1 mark.
Indien enige van die onderstreepte woorde/frases in die korrekte konteks uitgelaat word, trek een punt af.

(2)

9.3 FROM Q to P ✓/*VANAF Q tot P* (1)

9.4 Replace the commutator (split ring) ✓ with slip rings. ✓/
Vervang die kommutator (splitring) met 'n sleepring. (2)
✓

9.5 $P_{ave} = V_{rme} I_{rms}$ ✓
2000 = 220 I_{rms} ✓
I_{rms} = 9,09 A

I_{max} = I_{rms} √2 ✓
= 9,09 x √2 ✓
= 12,86 A ✓
If combined formulae – give the credit. (5)
[12]

QUESTION/*VRAAG* 10

10.1 The minimum frequency of light needed to emit electrons from a certain metal surface ✓✓
Die minimum frekwensie van lig benodig om elektrone vry te stel vanuit 'n sekere metaal se oppervlakte

OR/*OF*

A certain minimum frequency of incident radiation which will cause photoelectrons to be emitted from the surface of a metal✓✓
'n Sekere minimum frekwensie van invallende strale wat sal veroorsaak dat foto-elektrone uit die oppervlak van 'n metaal vrygestel word

Marking criteria/*Nasienriglyne:*
If any of the underlined words/phrases in the correct context is omitted, deduct 1 mark.
If learner explains **minimum energy** then **zero marks** are allocated. It has to be **frequency**.
Indien enige van die onderstreepte woorde/frases in die korrekte konteks uitgelaat word, trek 1 punt af.
*Indien leerder **minimum energie** verduidelik, dan **geen punte** toegeken nie. Dit moet **frekwensie** wees.* (2)

10.2 10.2.1 $W_0 = hf_0$ ✓
$= 6{,}63 \times 10^{-34}\ 5{,}1 \times 10^{14}$ ✓
$= 3{,}38 \times 10^{-19}$ J ✓

Marking guidelines/ *Nasienriglyne*:
✓ Formula/*Formule*
✓ Substitution/*Vervanging*
✓ Answer/*Antwoord* (3)

10.2.2 **OPTION/*OPSIE* 1**

$E = h\frac{c}{\lambda}$ ✓
$= \frac{6{,}63 \times 10^{-34} \times 3 \times 10^{8}}{400 \times 10^{-9}}$ ✓✓
$= 4{,}97 \times 10^{-19}$ J ✓

Marking guidelines/ *Nasienriglyne*:
✓ Formula/*Formule*
✓ ✓Substitution/*Vervanging*
✓ Answer/*Antwoord*

OPTION 2: *OPSIE* 2

$f = \frac{c}{\lambda}$

$= \frac{3 \times 10^{8}}{400 \times 10^{-9}}$ ✓

$= 7{,}50 \times 10^{14}$ Hz

E= hf ✓

$= 6{,}63 \times 10^{-34} \times 7{,}5 \times 10^{14}$ ✓

$= 4{,}97 \times 10^{-19}$ J ✓

(4)

10.2.3 **Positive marking from Question 10.2.1 and 10.2.2**
Positiewe nasien vanaf Vraag 10.2.1 en 10.2.2

E= $h\frac{c}{\lambda} = W_0 + Ek_{\text{max}/maks}$ ✓

$4{,}97 \times 10^{-19}$ ✓ = $3{,}38 \times 10^{-19}$ + $Ek_{max/maks}$ ✓

$Ek_{max/maks} = 1{,}59 \times 10^{-19}$ J ✓

Marking guidelines/*Nasienriglyne*:

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

Notes/*Notas*:

- If max. is omitted from Ek formula, marks are lost for the formula. The rest can however be marked./
- *Indien maks. uitgelaat word van formule met Ek, word punte verbeur vir die formule. Die res kan wel steeds punte kry.*

(4)

10.3 **Not to be marked. Mark moved to 10.2.2**

[13]

TOTAL/*TOTAAL*: 150