basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE
*NASIONALE
SENIOR SERTIFIKAAT***

GRADE/*GRAAD* 12

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

FEBRUARY/MARCH/*FEBRUARIE/MAART* 2012

MEMORANDUM

MARKS/*PUNTE:* 150

This memorandum consists of 15 pages.
Hierdie memorandum bestaan uit 15 bladsye.

Learning Outcomes and Assessment Standards *Leeruitkomste en Assesseringstandaarde*		
LO/*LU* 1	**LO/*LU* 2**	**LO/*LU* 3**
AS 12.1.1: Design, plan and conduct a scientific inquiry to collect data systematically with regard to accuracy, reliability and the need to control variables. *Ontwerp, beplan en voer 'n wetenskaplike ondersoek uit om data te versamel ten opsigte van akkuraatheid, betroubaarheid en die kontroleer van veranderlikes.*	**AS 12.2.1:** Define, discuss and explain prescribed scientific knowledge. *Definieer, bespreek en verduidelik voorgeskrewe wetenskaplike kennis.*	**AS 12.3.1:** Research, discuss, compare and evaluate scientific and indigenous knowledge systems and knowledge claims by indicating the correlation among them, and explain the acceptance of different claims. *Doen navorsing, bespreek, vergelyk en evalueer wetenskaplike en inheemse kennissisteme en kennisaansprake deur die ooreenkoms aan te dui en verduidelik die aanvaarding van verskillende aansprake.*
AS 12.1.2: Seek patterns and trends, represent them in different forms, explain the trends, use scientific reasoning to draw and evaluate conclusions, and formulate generalisations. *Soek patrone en tendense, stel dit in verskillende vorms voor, verduidelik tendense, gebruik wetenskaplike beredenering om gevolgtrekkings te maak en te evalueer, en formuleer veralgemenings.*	**AS 12.2.2:** Express and explain prescribed scientific principles, theories, models and laws by indicating the relationship between different facts and concepts in own words. *Verduidelik en druk voorgeskrewe wetenskaplike beginsels, teorieë, modelle en wette uit deur die verwantskap tussen verskillende feite en konsepte in eie woorde aan te dui.*	**AS 12.3.2:** Research case studies and present ethical and moral arguments from different perspectives to indicate the impact (pros and cons) of different scientific and technological applications. *Vors gevallestudies na en lewer etiese en morele argumente uit verskillende perspektiewe om die impak (voordele en nadele) van verskillende wetenskaplike en tegnologiese toepassings aan te dui.*
AS 12.1.3: Select and use appropriate problem-solving strategies to solve (unseen) problems. *Kies en gebruik geskikte probleemoplossingstrategieë om (ongesiene) probleme op te los.*	**AS 12.2.3:** Apply scientific knowledge in everyday life contexts. *Pas wetenskaplike kennis in kontekste van die alledaagse lewe toe.*	**AS 12.3.3:** Evaluate the impact of scientific and technological research and indicate the contribution to the management, utilisation and development of resources to ensure sustainability continentally and globally. *Evalueer die impak van wetenskaplike en tegnologiese navorsing en dui die bydrae tot bestuur, benutting en ontwikkeling van bronne om volhoubaarheid kontinentaal en globaal te verseker.*
AS 12.1.4: Communicate and defend scientific arguments with clarity and precision. *Kommunikeer en verdedig wetenskaplike argumente duidelik en presies.*		

SECTION A/*AFDELING A*

QUESTION 1/*VRAAG 1*

1.1   Kinetic energy/*Kinetiese energie* ✓   (1)

1.2   Interference/*Interferensie* ✓   (1)

1.3   Ohm ✓   (1)

1.4   Electromagnetic induction/*Elektromagnetiese induksie* ✓
        OR/*OF*
        Faraday's law/*Faraday se wet*   (1)

1.5   (Line) emission (spectrum) ✓   (1)
        (Lyn)emissie(spektrum)   **[5]**

QUESTION 2/*VRAAG 2*

2.1   B ✓✓   (2)

2.2   B ✓✓   (2)

2.3   C ✓✓   (2)

2.4   B ✓✓   (2)

2.5   C ✓✓   (2)

2.6   A ✓✓   (2)

2.7   D ✓✓   (2)

2.8   D ✓✓   (2)

2.9   C ✓✓   (2)

2.10   A ✓✓   (2)
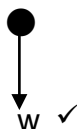   **[20]**

                        TOTAL SECTION A /*TOTAAL AFDELING A*:   25

SECTION B/*AFDELING B*

QUESTION 3/*VRAAG 3*

3.1

Accepted Labels/*Aanvaarde benoemings*	
w	F_g / F_w / force of Earth on stone/weight/mg/gravitational force *F_g / F_w / krag van Aarde op klip/gewig/mg/gravitasiekrag*

w ✓

(1)

3.2.1

Option 1/*Opsie 1*:	
Upward positive/*Opwaarts positief*: $v_f = v_i + a \Delta t$ ✓ $0 = 10$ ✓ $+ (-9,8) \Delta t$ ✓ ∴ $\Delta t = 1,02$ s ✓	Upward negative/*Opwaarts negatief*: $v_f = v_i + a \Delta t$ ✓ $0 = -10$ ✓ $+ 9,8 \Delta t$ ✓ ∴ $\Delta t = 1,02$ s ✓

Option 2/*Opsie 2*:

Upward positive/*Opwaarts positief*:

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

$0^2 = 10^2 + 2(-9,8) \Delta y$ ✓ — ✓ Both formulae/ *Beide formules*

∴ y = 5,1 m

$\Delta y = \left(\dfrac{v_i + v_f}{2} \right) \Delta t$

$5,1 = (\dfrac{10+0}{2})\Delta t$ ✓

∴ $\Delta t = 1,02$ s ✓

Upward negative/*Opwaarts negatief*:

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

$0^2 = (-10)^2 + 2(9,8) \Delta y$ ✓ — ✓ Both formulae/ *Beide formules*

∴ y = -5,1 m

$\Delta y = \left(\dfrac{v_i + v_f}{2} \right) \Delta t$

$-5,1 = (\dfrac{-10+0}{2})\Delta t$ ✓

∴ $\Delta t = 1,02$ s ✓

(4)

3.2.2   **POSITIVE MARKING FROM QUESTION 3.2.1 TO QUESTION 3.2.2**
POSITIEWE NASIEN VAN VRAAG 3.2.1 NA VRAAG 3.2.2

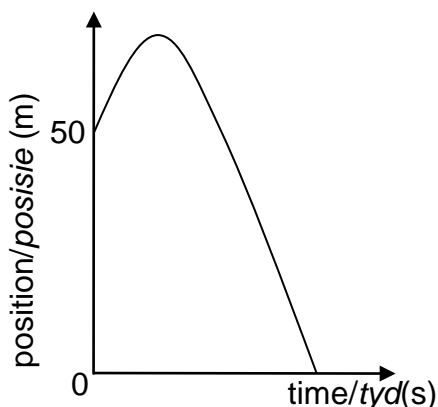| **Option 1/*Opsie 1*:** **Upward positive/*Opwaarts positief*:**	**Upward negative/*Opwaarts negatief*:**

$v_f^2 = v_i^2 + 2a\Delta y$ ✓
$0^2 = 10^2 + 2(-9,8) \Delta y$ ✓
∴ $\Delta y = 5,1$ m
 	
Height/*Hoogte* = 50 + ✓ 5,1
      = 55,1 m ✓
	$v_f^2 = v_i^2 + 2a\Delta y$ ✓
	$0^2 = (-10)^2 + 2(9,8) \Delta y$ ✓
	∴ $\Delta y = -5,1$ m
	
	Height/*Hoogte* = 50 + ✓ 5,1
	      = 55,1 m ✓

<table>
<tr><td>

Option 2/*Opsie 2:*
Upward positive/*Opwaarts positief*:

$\Delta y = \left(\dfrac{v_i + v_f}{2} \right) \Delta t$ ✓

$\Delta y = (\dfrac{10 + 0}{2})1{,}02$ ✓

$\therefore = 5{,}1$ m

Height = 50 + ✓ 5,1
        = 55,1 m ✓

Upward negative/*Opwaarts negatief*:

$\Delta y = \left(\dfrac{v_i + v_f}{2} \right) \Delta t$ ✓

$\Delta y = (\dfrac{-10 + 0}{2})1{,}02$ ✓

$\therefore \therefore \Delta y = -5{,}1$ m

Height/*Hoogte* = 50 + ✓ 5,1
        = 55,1 m ✓

</td><td>

Option 3/*Opsie 3*:
Consider downward motion/
Beskou afwaartse beweging:

$\Delta y = \left(\dfrac{v_i + v_f}{2} \right) \Delta t$ ✓

$\Delta y = (\dfrac{-10 + 0}{2})1{,}02$ ✓

$\therefore = -5{,}1$ m

Height = 50 + ✓ 5,1
        = 55,1 m ✓

Upward negative/*Opwaarts*
negatief*:*

$\Delta y = \left(\dfrac{v_i + v_f}{2} \right) \Delta t$ ✓

$\Delta y = (\dfrac{-10 + 0}{2})1{,}02$ ✓

$\therefore = -5{,}1$ m

Height/*Hoogte* = 50 + ✓ 5,1
        = 55,1 m ✓

</td></tr>
</table>

(4)

3.3

Criteria for graph/*Kriteria vir grafiek*	Marks/*Punte*
Correct shape/*Korrekte vorm*	✓
Final position lower than initial position.	✓
Graph ends on x axis./*Grafiek eindig op x-as*.	✓

Upward positive/*Opwaarts positief*

Upward negative/*Opwaarts negatief*

3.4

Option 1/*Opsie 1*

$$\Delta y = v_i \Delta t + \frac{1}{2} a \Delta t^2 \checkmark$$

$$1,5 \checkmark = v_i (0,1) + \frac{1}{2}(9,8)(0,1)^2 \checkmark$$

$$\therefore v_i = 14,51 \text{ m·s}^{-1}$$

From maximum height/*Van maksimum hoogte:*

$$v_f^2 = v_i^2 + 2a\Delta y \checkmark$$
$$14,51^2 \checkmark = (0)^2 + 2(9,8)\Delta y \checkmark$$
$$\therefore \Delta y = 10,74 \text{ m}$$

Height/*Hoogte* = 55,1 −10,74
= 44,36 m $\checkmark$

Option 2/*Opsie 2*	**Option 3/*Opsie 3***
$$\Delta y = v_i \Delta t + \frac{1}{2} a \Delta t^2 \checkmark$$ $$1,5\checkmark = v_i (0,1) + \frac{1}{2}(9,8)(0,1)^2 \checkmark$$ $$\therefore v_i = 14,51 \text{ m·s}^{-1}$$ Downwards from top of tower to top of window:/*Afwaarts van bopunt van toring tot bopunt van venster* $$v_f^2 = v_i^2 + 2a\Delta y \checkmark$$ $$14,51^2 \checkmark = (10)^2 + 2(9,8)\Delta y \checkmark$$ $$\therefore \Delta y = 5,64 \text{ m}$$ Height/*Hoogte* = 50 − 5,64 = 44,36 m $\checkmark$	$$\Delta y = v_i \Delta t + \frac{1}{2} a \Delta t^2 \checkmark$$ $$1,5\checkmark = v_i (0,1) + \frac{1}{2}(9,8)(0,1)^2 \checkmark$$ $$\therefore v_i = 14,51 \text{ m·s}^{-1}$$ From original point of projection:/*Van oorspronklike punt van projeksie* $$v_f^2 = v_i^2 + 2a\Delta y \checkmark$$ $$14,51^2 \checkmark = (-10)^2 + 2(9,8)\Delta y \checkmark$$ $$\therefore \Delta y = 5,64 \text{ m}$$ Height/*Hoogte* = 50 − 5,64 = 44,36 m $\checkmark$

Option 4/*Opsie 4*

$$\overline{v} = \frac{\Delta y}{\Delta t} = \frac{1,5}{0,1} = 15 \text{ m·s}^{-1}$$

$$\overline{v} = \frac{v_i + v_f}{2} = \underline{15}$$

$$\therefore v_i + v_f = 30 \text{ m·s}^{-1}$$
$$\therefore v_f = 30 - v_i$$

$$v_f = v_i + a\Delta t \checkmark$$
$$\underline{30 - v_i}\checkmark = \underline{v_i + 9,8(0,1)} \checkmark$$
$$\therefore v_i = 14,51 \text{ m·s}^{-1}$$
$$v_f^2 = v_i^2 + 2a\Delta y \checkmark$$
$$14,51^2 \checkmark = (0)^2 + 2(9,8)\Delta y \checkmark$$
$$\therefore \Delta y = 10,74 \text{ m}$$
Height/*Hoogte* = 55,1 − 10,74
= 44,36 m $\checkmark$

(7)

[19]

QUESTION 4/*VRAAG 4*

4.1   Impulse is the product of the (net/average) force and the time during which
        the force acts. ✓✓
        *Impuls is die produk van die (netto/gemiddelde) krag en die tyd waartydens
        die krag inwerk.* ✓✓

        OR/*OF*
        Impulse is the change in momentum. ✓✓
        Impuls is gelyk aan verandering in momentum. ✓✓   (2)

4.2

Option 1/*Opsie 1:*	**Option 2/*Opsie 2:***
Upward positive:/*Opwaarts positief*	Upward negative:/*Opwaarts negatief*
$F_{net}\Delta t = \Delta p$ ✓ $\quad = m(v_f - v_i)$ $\quad = 0{,}15(3{,}62 - (-6{,}2))$ ✓ $\quad = 1{,}473$ N·s / kg·m·s⁻¹ ✓ $\qquad\qquad$ upward/*opwaarts*	$F_{net}\Delta t = \Delta p$ ✓ $\quad = m(v_f - v_i)$ $\quad = 0{,}15[(-3{,}62 - (6.2))$ ✓ $\quad = -1{,}473$ N·s /kg·m·s⁻¹ $F_{net}\Delta t = 1{,}473$ N·s /kg·m·s⁻¹ ✓ $\qquad\qquad$ upward/*opwaarts*
Option 3/*Opsie 3:*	**Option 4/*Opsie 4:***
Upward positive: /*Opwaarts positief*	Upward negative: /*Opwaarts negatief*
$F_{net}\Delta t = \Delta p$ ✓ $\quad = mv_f - mv_i$ $\quad = (0{,}15)(3{,}62) - (0{,}15)(-6{,}2)$ ✓ $\quad = 1{,}473$ N·s / kg·m·s⁻¹ ✓ $\qquad\qquad$ upward/*opwaarts*	$F_{net}\Delta t = \Delta p$ ✓ $\quad = mv_f - mv_i)$ $\quad = (0{,}15)(-3{,}62) - (0{,}15)(6{,}2)$ ✓ $\quad = -1{,}473$ N·s /kg·m·s⁻¹ $F_{net}\Delta t = 1{,}473$ N·s /kg·m·s⁻¹ ✓ $\qquad\qquad$ upward/*opwaarts*

(3)

4.3 $(U + K)_{top/bo} = (U + K)_{bottom/onder}$ ✓
        $mgh_f + \frac{1}{2}mv_f^2 = mgh_i + \frac{1}{2}mv_i^2$
        $(0{,}15)(9{,}8)h + 0$ ✓ $= 0 + \frac{1}{2}(0{,}15)(6{,}2)^2$ ✓
        $\therefore h = 1{,}96$ m ✓

        $\dfrac{1{,}96}{3} = 0{,}65$ m
        Yes/Meets requirements ✓

        Ja/Voldoen aan vereistes. ✓

K(bottom/*onder*) = U(top/*bo*)
Max.: $\dfrac{0}{4}$
Other formulae/*Ander formules*: $E_{mech(A)} = E_{mech(B)}$ / $E_{mech(i)} = E_{mech(f)}$ $E_{mech(top)} = E_{mech(bottom)}$ $(E_p + E_k)_A = (E_p + E_k)_B$ $(E_p + E_k)_{bottom} = (E_p + E_k)_{top}$ $E_p + E_k)_i = (E_p + E_k)_f$ $(U + K)_i = (U + K)_f$ $(U + K)_A = (U + K)_B$ $mgh_B + \frac{1}{2}mv_i^2 = mgh_B + \frac{1}{2}mv_f^2$

(5)
[10]

QUESTION 5/*VRAAG 5*

5.1   The <u>energy of an object due to its position</u> ✓
<u>above the surface of the earth</u>. ✓

*Die <u>energie van 'n voorwerp as gevolg sy posisie</u> ✓
<u>bokant die oppervlak van die aarde</u>. ✓*   (2)

5.2
Option 1/*Opsie 1:*
$W_{net} = \Delta K$ ✓
$mg\Delta y\cos\theta + W_f = \frac{1}{2}m v_f^2 - \frac{1}{2}m v_i^2$
$(2)(9,8)(2)\cos 0°$ ✓ $+ W_f$ ✓ $= \frac{1}{2}(2)(5)^2$✓$- 0$ ✓
$\therefore W_f = -14,2$ J ✓

Option 2/*Opsie 2:*
$W_{net} = \Delta K$ ✓
$-\Delta U + W_f = \frac{1}{2}m v_f^2 - \frac{1}{2}m v_i^2$
$mgh + W_f = \frac{1}{2}m v_f^2 - \frac{1}{2}m v_i^2$
$(2)(9,8)(2)$ ✓ $+ W_f$ ✓ $= \frac{1}{2}(2)(5)^2$✓$- 0$ ✓
$\therefore W_f = -14,2$ J ✓

(6)

5.3   No/*Nee* ✓
Friction is present/*Wrywing is aanwesig.* ✓   (2)

5.4.1 $\Sigma p_{before} = \Sigma p_{after}$ ✓
<u>$(2)(5) + (9)(0)$</u> ✓ $=$ <u>$2v_{f2} + (9)(1)$</u> ✓

$\therefore v_{f2} = 0,5$ m·s^{-1} ✓

Notes/*Aantekeninge:*
Other formulae/*Ander formules*:
$m_1v_{i1} + m_2v_{i2} = m_1v_{f1} + m_2v_{f2}$
$m_1u_1 + m_2u_2 = m_1v_1 + m_2v_2$

(4)

5.4.2   K(total after/*total na*) $= \frac{1}{2}m_1 v_f^2 + \frac{1}{2}m_2 v_f^2$ ✓
              $= \frac{1}{2}(2)(0,5)^2$ ✓ $+ \frac{1}{2}(9)(1)^2$✓
              $= 4,75$ J ✓
K(total before) $\neq$ K(total after) ✓
$\therefore$ inelastic

K(totaal na) $\neq$ *K(totaal voor)* ✓
$\therefore$ *onelasties*   (5)

[19]

QUESTION 6/*VRAAG 6*

6.1

$$f_L = \frac{v \pm v_L}{v \pm v_s} f_s \ \text{OR} \ f_L = \frac{v}{v - v_s} f_s \ \checkmark$$

$$\therefore 1\ 050 \ \checkmark = \frac{340 + 0}{340 - v_s} (980) \ \checkmark$$

$$\therefore v_s = 22{,}67 \ \text{m·s}^{-1} \ \checkmark \tag{4}$$

6.2   Waves in front of the moving source are compressed.
The observed <u>wavelength decreases</u>. ✓
For the <u>same speed of sound</u>, ✓a higher frequency will be observed.

Golwe voor die bewegende bron word saamgepers.
Die waargenome <u>golflengte verminder</u>. ✓
Vir <u>dieselfde spoed van klank</u> ✓*sal 'n hoër frekwensie waargeneem word.*   (2)

6.3   Any ONE/*Enige EEN*:
- Determine whether <u>arteries are clogged</u>/narrowed ✓
  so that <u>precautions can be taken in advance/to prevent heart attack /stroke.</u> ✓
  Bepaal of <u>are verstop/vernou is</u>, ✓✓
  sodat <u>voorsorg getref kan word/om hartaanvalle/beroerte te voorkom</u>. ✓

- Determine <u>heartbeat of foetus</u>
  to assure that <u>child is alive</u>/does not have a heart defect.
  Bepaal die <u>hartklop</u> van 'n <u>fetus</u>
  om seker te maak of <u>baba leef</u>/geen hartdefekte het nie.   (2)

[8]

QUESTION 7/*VRAAG 7*

7.1

Criteria for investigative question/*Kriteria vir ondersoekende vraag:*	Mark/*Punt*
The <u>dependent</u> and <u>independent</u> variables are stated. *Die <u>afhanklike</u> en <u>onafhanklike</u> veranderlikes is genoem.*	✓
Asks a question about the relationship between dependent and independent variables. *Vra 'n vraag oor die verwantskap tussen die <u>afhanklike</u> en <u>onafhanklike</u> veranderlikes.*	✓

<u>Dependent variable:</u>
*<u>Afhanklike veranderlike</u>***:**
Broadness of central (bright) band/degree of diffraction
Breedte van sentrale (helder) band/mate van diffraksie
<u>Independent variable:</u>
<u>Onafhanklike veranderlike:</u>
Wavelength (of light)/*Golflengte (van lig)*

Example/*Voorbeeld:*
How will the <u>width of the central band</u> change/differ when the wavelength (of the light) <u>changes</u>/is increased/is decreased?
Hoe sal die <u>breedte van die sentrale helder band</u> verander wanneer die golflengte (van die lig) <u>toeneem/afneem</u>?   (2)

7.2   Slit width/*Spleetwydte* ✓
Distance between slit and screen/*Afstand tussen spleet en skerm.* ✓   (2)

7.3 $\tan\theta = \dfrac{0{,}033}{0{,}45}$ ✓ ∴ θ = 4,19(4)°

$\sin\theta = \dfrac{m\lambda}{a}$ ✓

$\sin 4{,}19°$ ✓ $= \dfrac{(1)\lambda}{5{,}6\times 10^{-7}}$ ✓

∴ λ = 4,1 x 10^{-8} m ✓   (5)

7.4   Greater than/*Groter as* ✓
<u>Red light has a longer wavelength</u> (and is diffracted more.) ✓
Rooilig het 'n langer golflengte (en word meer diffrakteer.)

OR/*OF*   (2)
Diffraction/*Diffraksie* α λ ✓   **[11]**

QUESTION 8/*VRAAG 8*

8.1 <u>The (electrostatic) force experienced at a point</u> ✓
<u>per unit charge</u> at that point. ✓
Die <u>elektrostatiese krag ondervind by 'n punt</u> ✓
<u>per eenheidslading</u> by daardie punt. ✓
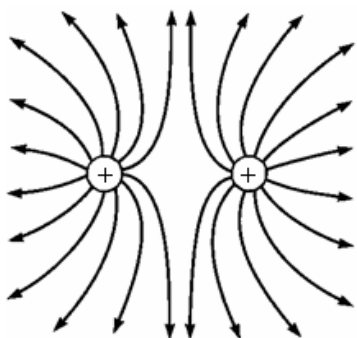
OR/*OF*
<u>The (electrostatic) force experienced</u> ✓
by a <u>charge</u> placed at that point divided by the charge itself. ✓
Die (elektrostatiese) <u>krag ondervind</u> ✓
deur 'n <u>lading</u> geplaas by daardie punt gedeel deur die lading self. ✓   (2)

8.2

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

(3)

8.3 $E_P = \dfrac{kQ}{r^2}$ ✓

$= \dfrac{(9 \times 10^9)(5 \times 10^{-9})}{(30 \times 10^{-3})^2}$ ✓

$= 5 \times 10^4$ N·C⁻¹ to the right/*na regs*

$E_Q = \dfrac{kQ}{r^2}$

$= \dfrac{(9 \times 10^9)(5 \times 10^{-9})}{(10 \times 10^{-3})^2}$ ✓

$= 4{,}5 \times 10^5$ N·C⁻¹ to the right/*na regs*

$E_{net} = 5 \times 10^4 + 4{,}5 \times 10^5$
$= 5 \times 10^5$ N·C⁻¹ to the right/*na regs* ✓   (6)

8.4   **POSITIVE MARKING FROM QUESTION 8.3 TO QUESTION 8.4/**
POSITIEWE NASIEN VAN VRAAG 8.3 NA VRAAG 8.4
$E = \dfrac{F}{q}$ ✓

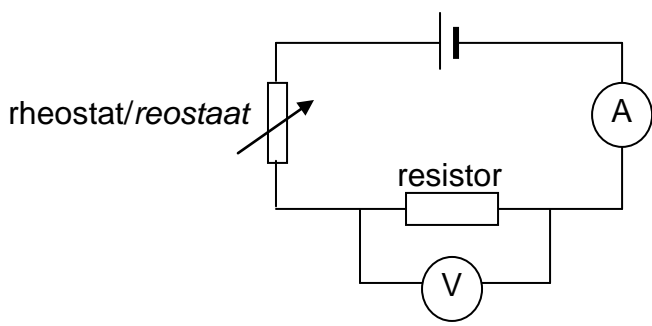$5 \times 10^5 = \dfrac{F}{1{,}6 \times 10^{-19}}$ ✓
$F = 8 \times 10^{-14}$ N ✓   (3)

[14]

QUESTION 9/*VRAAG 9*

9.1
9.1.1

Criteria for circuit diagram/*Kriteria vir stroombaandiagram*	Mark/*Punt*
Battery connected to the resistor as shown – correct symbols used. *Battery aan resistor geskakel soos getoon – korrekte simbole is gebruik.*	✓
Rheostat connected in series with resistor – correct symbols used. *Reostaat in serie geskakel met resistor – korrekte simbole is gebruik.*	✓
Ammeter connected in series so that it measures the current through resistor – correct symbols used. *Ammeter in serie geskakel sodat dit die stroom deur die resistor meet – korrekte simbole is gebruik.*	✓
Voltmeter connected in parallel across resistor – correct symbols used. *Voltmeter in parallel geskakel oor resistor – korrekte simbole is gebruik.*	✓

(4)

9.1.2   Temperature/*Temperatuur* ✓   (1)

9.1.3   B ✓

The ratio $\dfrac{V}{I}$ is greater than that of A. ✓✓

B ✓

Die verhouding $\dfrac{V}{I}$ is groter as die van A. ✓✓

OR/*OF*

B ✓

The ratio $\dfrac{I}{V}$ is smaller than that of A. ✓✓

B ✓

Die verhouding $\dfrac{I}{V}$ is kleiner as die van A. ✓✓

(3)

9.2

9.2.1

$$\frac{1}{R} = \frac{1}{r_1} + \frac{1}{r_2} \checkmark = \frac{1}{4} + \frac{1}{16} \checkmark$$

$$\therefore R = 3,2 \ \Omega$$

$R_{effective/effektief} = 3,2 \ \Omega + 2 \ \Omega + 0,8 \ \Omega \checkmark$
$\qquad\qquad = 6 \ \Omega \checkmark$ (4)

9.2.2

Option 1/*Opsie 1:*	**Option 2/*Opsie 2*:**
V = IR $\checkmark$	emf = I(R + r) $\checkmark$
12 = I(6) $\checkmark$	12 = I(5,2 + 0,8) $\checkmark$
I = 2 A $\checkmark$	I = 2 A $\checkmark$

(3)

9.2.3

Option 1/*Opsie 1*:	**Option 2/*Opsie 2*:**
$V_{parallel}$ = IR $\checkmark$ $\qquad$ =(2)(3,2) $\checkmark$ $\qquad$ = 6,4 V $V_{8\Omega} = \dfrac{6,4}{2}$ $\checkmark$ = 3,2 V $\checkmark$	$V_p = \dfrac{R_p}{R} \times V$ $\checkmark$ $\quad = \dfrac{3,2}{6}$ $\checkmark$ $\times$ 12 $\checkmark$ = 6,4 V $\therefore V_{8\Omega}$ = 3,2 V $\checkmark$
Option 3/*Opsie 3*:	**Option 4/*Opsie 4*:**
$I_{8\Omega} = \dfrac{4}{20}(2)$ $\checkmark$ $\qquad = 0,4$ A $V_{8\Omega}$ = IR $\checkmark$ $\qquad = (0,4)(8)$ $\checkmark$ $\qquad = 3,2$ V $\checkmark$	emf = I(R + r) $\checkmark$ 12 = $IR_{2\,\Omega}$ + V_p + Ir 12 = (2)(2) + V_p + (2)(0,8) $\checkmark$ Vp = 6,4 V $V_{8\Omega} = \dfrac{6,4}{2}$ $\checkmark$ = 3,2 V $\checkmark$

(4)
[19]

QUESTION 10/*VRAAG 10*

10.1
10.1.1
  (a) Reverses the direction of the current in the coil each half cycle. ✓
       Keer die stroomrigting in die spoel elke halwe siklus. ✓

       OR/*OF*
       Maintains constant direction of rotation of the coil.
       Onderhou die konstante rigting van rotasie van die spoel.   (1)

10.1.1 Makes electrical contact (with the commutator). ✓
  (b)   *Maak elektriese kontak (met kommutator).* ✓

       OR/*OF*
       Allows split-ring commutator to rotate freely.
       Laat splitringkommutator toe om vry te roteer.

       OR/*OF*
       Allows charges to flow/current in and out of the coil.
       Laat vloei van lading/stroom in en uit spoel toe.   (1)

10.1.2 B to/*na* A ✓   (1)

10.1.3 Maximum/*Maksimum* ✓   (1)

10.1.4 Any ONE/*Enige EEN*:
       • Increase the current in the coil. ✓
         Verhoog die stroom in die spoel. ✓

       • Increase the magnitude of the magnetic field./Use a stronger magnet.
         Vergroot die grootte van die magneetveld./Gebruik 'n sterker magneet.

       • Increase the number of turns in the coil.
         Verhoog die aantal windinge in die spoel.

       • Use a soft iron core as the core of the *coil.*
         Gebruik 'n sagte ysterkern in die spoel.
                                                                                       (1)

10.2
10.2.1 Any ONE/*Enige EEN:*
       • Can be transmitted over long distances without major energy loss. ✓
         Kan oor groot afstande oorgedra word sonder groot energieverlies. ✓

       • The potential difference can be increased or decreased.
         Die potensiaalverskil kan verhoog of verlaag word.   (1)

10.2.2
  (a) $V_{rms/wgk} = \dfrac{V_{max/maks}}{\sqrt{2}}$ ✓

       $230 = \dfrac{V_{max/maks}}{\sqrt{2}}$ ✓

       $V_{max/maks} = 325,27 \text{ V}$ ✓

                                                                                       (3)

10.2.2

(b) $P_{ave} = V_{rms/wgk}I_{rms/wgk}$ ✓

$2\ 000 = (230)I_{rms/wgk}$ ✓
    $I_{rms/wgk} = 8,70\ A$ ✓   (8,696 A)   (3)

[12]

QUESTION 11/*VRAAG 11*

11.1   Photoelectric effect/*Foto-elektriese effek* ✓   (1)

11.2
11.2.1 $E = hf$ ✓
         $= (6,63 \times 10^{-34})(6,16 \times 10^{14})$ ✓
         $= 4,08 \times 10^{-19}\ J$ ✓   (3)

11.2.2 $E = W_0 + K$ ✓

$4,08 \times 10^{-19}$ ✓ $= (6,63 \times 10^{-34})f_0$ ✓ $+ 5,6 \times 10^{-20}$ ✓

$f_0 = 5,31 \times 10^{14}\ Hz$ ✓   (5)

11.3
11.3.1   Increases ✓
         <u>More photoelectrons emitted per second</u> ✓

         Vermeerder ✓
         <u>*Meer foto-elektrone vrygestel per sekonde*</u> ✓   (2)

11.3.2   Remains the same ✓
         Intensity does not affect energy. ✓
         Bly dieselfde ✓
         Intensiteit het geen effek op energie nie. ✓

         OR/*OF*
         Remains the same ✓
         The frequency of light remains the same. ✓
         Bly dieselfde ✓
         Die frekwensie van die lig bly dieselfde. ✓   (2)

[13]

TOTAL SECTION B/*TOTAAL AFDELING B*:   125
GRAND TOTAL/*GROOTTOTAAL*:   150