



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 Leeruitkomst en Assesseringstandaarde		
LO/LU 1	LO/LU 2	LO/LU 3
<p>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. <i>Ontwerp, beplan en voer 'n wetenskaplike ondersoek uit om data te versamel ten opsigte van akkuraatheid, betroubaarheid en die kontroleer van veranderlikes.</i></p> <p>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. <i>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.</i></p> <p>AS 12.1.3: Select and use appropriate problem-solving strategies to solve (unseen) problems. <i>Kies en gebruik geskikte probleemoplossingstrategieë om (ongesiene) probleme op te los.</i></p> <p>AS 12.1.4: Communicate and defend scientific arguments with clarity and precision. <i>Kommunikeer en verdedig wetenskaplike argumente duidelik en presies.</i></p>	<p>AS 12.2.1: Define, discuss and explain prescribed scientific knowledge. <i>Definieer, bespreek en verduidelik voorgeskrewe wetenskaplike kennis.</i></p> <p>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. <i>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.</i></p> <p>AS 12.2.3: Apply scientific knowledge in everyday life contexts. <i>Pas wetenskaplike kennis in kontekste van die alledaagse lewe toe.</i></p>	<p>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. <i>Doen navorsing, bespreek, vergelyk en evalueer wetenskaplike en inheemse kennisisteme en kennisaansprake deur die ooreenkoms aan te dui en verduidelik die aanvaarding van verskillende aansprake.</i></p> <p>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. <i>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.</i></p> <p>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. <i>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.</i></p>

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]

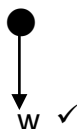
TOTAL SECTION A / TOTAAL AFDELING A: 25

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



(1)

3.2.1

<p>Option 1/Opsie 1: Upward positive/Opwaarts positief: $v_f = v_i + a \Delta t$ ✓ $0 = 10 + (-9,8) \Delta t$ ✓ $\therefore \Delta t = 1,02 \text{ s}$ ✓</p>	<p>Upward negative/Opwaarts negatief: $v_f = v_i + a \Delta t$ ✓ $0 = -10 + 9,8 \Delta t$ ✓ $\therefore \Delta t = 1,02 \text{ s}$ ✓</p>
<p>Option 2/Opsie 2: Upward positive/Opwaarts positief: $v_f^2 = v_i^2 + 2a\Delta y$ $0^2 = 10^2 + 2(-9,8) \Delta y$ ✓ $\therefore y = 5,1 \text{ m}$ $\Delta y = \left(\frac{v_i + v_f}{2} \right) \Delta t$ $5,1 = \left(\frac{10 + 0}{2} \right) \Delta t$ ✓ $\therefore \Delta t = 1,02 \text{ s}$ ✓</p>	<p>Upward negative/Opwaarts negatief: $v_f^2 = v_i^2 + 2a\Delta y$ $0^2 = (-10)^2 + 2(9,8) \Delta y$ ✓ $\therefore y = -5,1 \text{ m}$ $\Delta y = \left(\frac{v_i + v_f}{2} \right) \Delta t$ $-5,1 = \left(\frac{-10 + 0}{2} \right) \Delta t$ ✓ $\therefore \Delta t = 1,02 \text{ s}$ ✓</p>

(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**

<p>Option 1/Opsie 1: Upward positive/Opwaarts positief: $v_f^2 = v_i^2 + 2a\Delta y$ ✓ $0^2 = 10^2 + 2(-9,8) \Delta y$ ✓ $\therefore \Delta y = 5,1 \text{ m}$ Height/Hoogte = $\frac{50}{2} + 5,1$ $= 55,1 \text{ m}$ ✓</p>	<p>Upward negative/Opwaarts negatief: $v_f^2 = v_i^2 + 2a\Delta y$ ✓ $0^2 = (-10)^2 + 2(9,8) \Delta y$ ✓ $\therefore \Delta y = -5,1 \text{ m}$ Height/Hoogte = $50 + 5,1$ $= 55,1 \text{ m}$ ✓</p>
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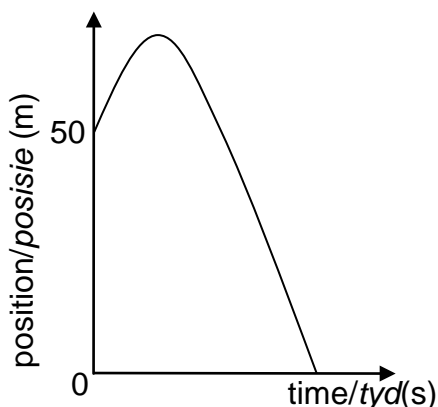
<p>Option 2/Opsie 2: Upward positive/Opwaarts positief: $\Delta y = \left(\frac{v_i + v_f}{2} \right) \Delta t \checkmark$ $\Delta y = \left(\frac{10+0}{2} \right) 1,02 \checkmark$ $\therefore = 5,1 \text{ m}$ Height = 50 + \checkmark 5,1 = 55,1 m \checkmark</p> <p>Upward negative/Opwaarts negatief: $\Delta y = \left(\frac{v_i + v_f}{2} \right) \Delta t \checkmark$ $\Delta y = \left(\frac{-10+0}{2} \right) 1,02 \checkmark$ $\therefore \therefore \Delta y = -5,1 \text{ m}$ Height/Hoogte = 50 + \checkmark 5,1 = 55,1 m \checkmark</p>	<p>Option 3/Opsie 3: Consider downward motion/ Beskou afwaartse beweging: $\Delta y = \left(\frac{v_i + v_f}{2} \right) \Delta t \checkmark$ $\Delta y = \left(\frac{-10+0}{2} \right) 1,02 \checkmark$ $\therefore = -5,1 \text{ m}$ Height = 50 + \checkmark 5,1 = 55,1 m \checkmark</p> <p>Upward negative/Opwaarts negatief: $\Delta y = \left(\frac{v_i + v_f}{2} \right) \Delta t \checkmark$ $\Delta y = \left(\frac{-10+0}{2} \right) 1,02 \checkmark$ $\therefore = -5,1 \text{ m}$ Height/Hoogte = 50 + \checkmark 5,1 = 55,1 m \checkmark</p>
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(4)

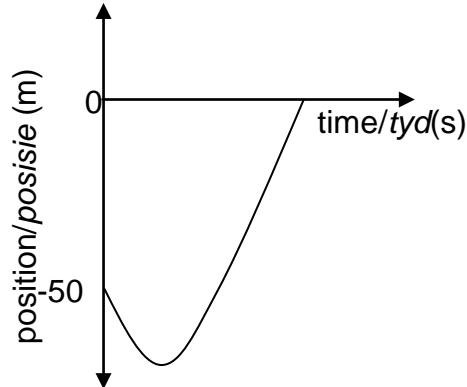
3.3

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

Upward positive/Opwaarts positief



Upward negative/Opwaarts negatief



3.4

<p><u>Option 1/Opsie 1</u></p> $\Delta y = v_i \Delta t + \frac{1}{2} a \Delta t^2 \checkmark$ $1,5 \checkmark = v_i(0,1) + \frac{1}{2}(9,8)(0,1)^2 \checkmark$ $\therefore v_i = 14,51 \text{ m}\cdot\text{s}^{-1}$ <p>From maximum height/<i>Van maksimum hoogte:</i></p> $v_f^2 = v_i^2 + 2a\Delta y \checkmark$ $14,51^2 \checkmark = (0)^2 + 2(9,8) \Delta y \checkmark$ $\therefore \Delta y = 10,74 \text{ m}$ <p>Height/<i>Hoogte</i> = 55,1 – 10,74 = 44,36 m ✓</p>	
<p><u>Option 2/Opsie 2</u></p> $\Delta y = v_i \Delta t + \frac{1}{2} a \Delta t^2 \checkmark$ $1,5 \checkmark = v_i(0,1) + \frac{1}{2}(9,8)(0,1)^2 \checkmark$ $\therefore v_i = 14,51 \text{ m}\cdot\text{s}^{-1}$ <p>Downwards from top of tower to top of window:<i>/Afwaarts van bopunt van toring tot bopunt van venster</i></p> $v_f^2 = v_i^2 + 2a\Delta y \checkmark$ $14,51^2 \checkmark = (10)^2 + 2(9,8) \Delta y \checkmark$ $\therefore \Delta y = 5,64 \text{ m}$ <p>Height/<i>Hoogte</i> = 50 – 5,64 = 44,36 m ✓</p>	<p><u>Option 3/Opsie 3</u></p> $\Delta y = v_i \Delta t + \frac{1}{2} a \Delta t^2 \checkmark$ $1,5 \checkmark = v_i(0,1) + \frac{1}{2}(9,8)(0,1)^2 \checkmark$ $\therefore v_i = 14,51 \text{ m}\cdot\text{s}^{-1}$ <p>From original point of projection:<i>/Van oorspronklike punt van projeksie</i></p> $v_f^2 = v_i^2 + 2a\Delta y \checkmark$ $14,51^2 \checkmark = (-10)^2 + 2(9,8) \Delta y \checkmark$ $\therefore \Delta y = 5,64 \text{ m}$ <p>Height/<i>Hoogte</i> = 50 – 5,64 = 44,36 m ✓</p>
<p><u>Option 4/Opsie 4</u></p> $\bar{v} = \frac{\Delta y}{\Delta t} = \frac{1,5}{0,1} = 15 \text{ m}\cdot\text{s}^{-1}$ $\bar{v} = \frac{v_i + v_f}{2} = 15$ $\therefore v_i + v_f = 30 \text{ m}\cdot\text{s}^{-1}$ $\therefore v_f = 30 - v_i$ $v_f = v_i + a \Delta t \checkmark$ $30 - v_i \checkmark = v_i + 9,8(0,1) \checkmark$ $\therefore v_i = 14,51 \text{ m}\cdot\text{s}^{-1}$ $v_f^2 = v_i^2 + 2a\Delta y \checkmark$ $14,51^2 \checkmark = (0)^2 + 2(9,8) \Delta y \checkmark$ $\therefore \Delta y = 10,74 \text{ m}$ <p>Height/<i>Hoogte</i> = 55,1 – 10,74 = 44,36 m ✓</p>	

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

<p>Option 1/Opsie 1: Upward positive:/Opwaarts positief</p> $F_{\text{net}} \Delta t = \Delta p \checkmark$ $= m(v_f - v_i)$ $= 0,15(3,62 - (-6,2)) \checkmark$ $= 1,473 \text{ N}\cdot\text{s} / \text{kg}\cdot\text{m}\cdot\text{s}^{-1} \checkmark$ <p style="text-align: right;">upward/opwaarts</p>	<p>Option 2/Opsie 2: Upward negative:/Opwaarts negatief</p> $F_{\text{net}} \Delta t = \Delta p \checkmark$ $= m(v_f - v_i)$ $= 0,15[(-3,62 - (6,2))] \checkmark$ $= -1,473 \text{ N}\cdot\text{s} / \text{kg}\cdot\text{m}\cdot\text{s}^{-1} \checkmark$ $F_{\text{net}} \Delta t = 1,473 \text{ N}\cdot\text{s} / \text{kg}\cdot\text{m}\cdot\text{s}^{-1} \checkmark$ <p style="text-align: right;">upward/opwaarts</p>
<p>Option 3/Opsie 3: Upward positive: /Opwaarts positief</p> $F_{\text{net}} \Delta t = \Delta p \checkmark$ $= mv_f - mv_i$ $= (0,15)(3,62) - (0,15)(-6,2) \checkmark$ $= 1,473 \text{ N}\cdot\text{s} / \text{kg}\cdot\text{m}\cdot\text{s}^{-1} \checkmark$ <p style="text-align: right;">upward/opwaarts</p>	<p>Option 4/Opsie 4: Upward negative: /Opwaarts negatief</p> $F_{\text{net}} \Delta t = \Delta p \checkmark$ $= mv_f - mv_i$ $= (0,15)(-3,62) - (0,15)(6,2) \checkmark$ $= -1,473 \text{ N}\cdot\text{s} / \text{kg}\cdot\text{m}\cdot\text{s}^{-1} \checkmark$ $F_{\text{net}} \Delta t = 1,473 \text{ N}\cdot\text{s} / \text{kg}\cdot\text{m}\cdot\text{s}^{-1} \checkmark$ <p style="text-align: right;">upward/opwaarts</p>

(3)

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

$$\frac{1,96}{3} = 0,65 \text{ m}$$

Yes/Meets requirements ✓

Ja/Voldoen aan vereistes. ✓

<p>K(bottom/onder) = U(top/bo) Max.: $\frac{0}{4}$</p>
<p>Other formulae/Ander formules: $E_{\text{mech(A)}} = E_{\text{mech(B)}} / E_{\text{mech(i)}} = E_{\text{mech(f)}}$ $E_{\text{mech(top)}} = E_{\text{mech(bottom)}}$ $(E_p + E_k)_A = (E_p + E_k)_B$ $(E_p + E_k)_{\text{bottom}} = (E_p + E_k)_{\text{top}}$ $E_p + E_k)_i = (E_p + E_k)_f$ $(U + K)_i = (U + K)_f$ $(U + K)_A = (U + K)_B$ $mgh_B + \frac{1}{2} m v_i^2 = mgh_B + \frac{1}{2} m v_f^2$</p>

(5)
[10]

QUESTION 5/VRAAG 5

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

*Die energie van 'n voorwerp as gevolg sy posisie ✓
bokant die oppervlak van die aarde. ✓*

(2)

5.2

<p>Option 1/Opsie 1: $W_{\text{net}} = \Delta K$ ✓ $mg\Delta y \cos\theta + W_f = \frac{1}{2}m v_f^2 - \frac{1}{2}m v_i^2$ $(2)(9,8)(2)\cos 0^\circ + W_f = \frac{1}{2}(2)(5)^2 - 0$ ✓ $\therefore W_f = -14,2 \text{ J}$ ✓</p>
<p>Option 2/Opsie 2: $W_{\text{net}} = \Delta K$ ✓ $-\Delta U + W_f = \frac{1}{2}m v_f^2 - \frac{1}{2}m v_i^2$ $mgh + W_f = \frac{1}{2}m v_f^2 - \frac{1}{2}m v_i^2$ $(2)(9,8)(2) + W_f = \frac{1}{2}(2)(5)^2 - 0$ ✓ $\therefore W_f = -14,2 \text{ J}$ ✓</p>

(6)

5.3 No/Nee ✓
 Friction is present/Wrywing is aanwesig. ✓

(2)

5.4.1 $\Sigma p_{\text{before}} = \Sigma p_{\text{after}}$ ✓
 $(2)(5) + (9)(0) = 2v_{f2} + (9)(1)$ ✓
 $\therefore v_{f2} = 0,5 \text{ m}\cdot\text{s}^{-1}$ ✓

<p>Notes/Aantekeninge: Other formulae/Ander formules: $m_1v_{i1} + m_2v_{i2} = m_1v_{f1} + m_2v_{f2}$ $m_1u_1 + m_2u_2 = m_1v_1 + m_2v_2$</p>
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(4)

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

$K(\text{total before}) \neq K(\text{total after})$ ✓
 \therefore inelastic

$K(\text{totaal na}) \neq K(\text{totaal voor})$ ✓
 \therefore onelasties

(5)

[19]

QUESTION 6/VRAAG 6

6.1 $f_L = \frac{v \pm v_L}{v \pm v_s} f_s$ OR $f_L = \frac{v}{v - v_s} f_s$ ✓
 $\therefore 1\,050 \checkmark = \frac{340 + 0}{340 - v_s} (980) \checkmark$
 $\therefore v_s = 22,67 \text{ m}\cdot\text{s}^{-1} \checkmark$ (4)

6.2 Waves in front of the moving source are compressed.
The observed wavelength decreases. ✓
For the same speed of sound, ✓ a higher frequency will be observed.
Golwe voor die bewegende bron word saamgepers.
Die waargenome golflengte verminder. ✓
Vir dieselfde spoed van klank ✓ sal 'n hoër frekwensie waargeneem word. (2)

6.3 Any ONE/Enige EEN:
• Determine whether arteries are clogged/narrowed ✓
so that precautions can be taken in advance/to prevent heart attack/stroke. ✓
Bepaal of are verstop/vernou is, ✓✓
sodat voorsorg getref kan word/om hartaanvalle/beroerte te voorkom. ✓
• Determine heartbeat of foetus
to assure that child is alive/does not have a heart defect.
Bepaal die hartklop van 'n fetus
om seker te maak of baba leef/geen hartdefekte het nie. (2)
[8]

QUESTION 7/VRAAG 7

7.1

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

Dependent variable:

Afhanklike veranderlike:

Broadness of central (bright) band/degree of diffraction
Breedte van sentrale (helder) band/mate van diffraksie

Independent variable:

Onafhanklike veranderlike:

Wavelength (of light)/Golflengte (van lig)

Example/*Voorbeeld:*

How will the width of the central band change/differ when the wavelength (of the light) changes/is increased/is decreased?

Hoe sal die breedte van die sentrale helder band verander wanneer die golflengte (van die lig) toeneem/afneem?

(2)

7.2

Slit width/*Spleetwydte* ✓

Distance between slit and screen/*Afstand tussen spleet en skerm.* ✓

(2)

7.3

$$\tan \theta = \frac{0,033}{0,45} \checkmark \therefore \theta = 4,19(4)^\circ$$

$$\sin \theta = \frac{m\lambda}{a} \checkmark$$

$$\sin 4,19^\circ \checkmark = \frac{(1)\lambda}{5,6 \times 10^{-7}} \checkmark$$

$$\therefore \lambda = 4,1 \times 10^{-8} \text{ m } \checkmark$$

(5)

7.4

Greater than/*Groter as* ✓

Red light has a longer wavelength (and is diffracted more.) ✓

Rooilig het 'n langer golflengte (en word meer diffrakteer.)

OR/OF

Diffraction/*Diffraksie* $\propto \lambda$ ✓

(2)

[11]

QUESTION 8/VRAAG 8

- 8.1 The (electrostatic) force experienced at a point ✓
per unit charge at that point. ✓
Die elektrostatiese krag ondervind by 'n punt ✓
per eenheidslading by daardie punt. ✓

OR/OF

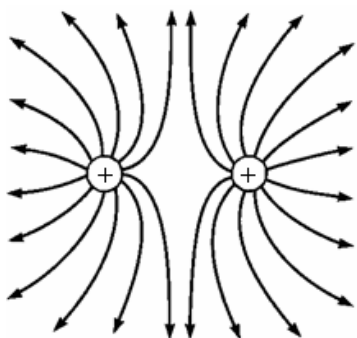
The (electrostatic) force experienced ✓
by a charge placed at that point divided by the charge itself. ✓

Die (elektrostatiese) krag ondervind ✓

deur 'n lading geplaas by daardie punt gedeel deur die lading self. ✓

(2)

8.2



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

(3)

8.3

$$E_P = \frac{kQ}{r^2} \checkmark$$

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

$$= 5 \times 10^4 \text{ N} \cdot \text{C}^{-1} \text{ to the right/na regs}$$

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

$$= \frac{(9 \times 10^9)(5 \times 10^{-9})}{(10 \times 10^{-3})^2} \checkmark$$

$$= 4,5 \times 10^5 \text{ N} \cdot \text{C}^{-1} \text{ to the right/na regs}$$

$$E_{\text{net}} = 5 \times 10^4 + 4,5 \times 10^5$$

$$= 5 \times 10^5 \text{ N} \cdot \text{C}^{-1} \text{ to the right/na regs} \checkmark$$

(6)

8.4

**POSITIVE MARKING FROM QUESTION 8.3 TO QUESTION 8.4/
POSITIEWE NASIEN VAN VRAAG 8.3 NA VRAAG 8.4**

$$E = \frac{F}{q} \checkmark$$

$$5 \times 10^5 = \frac{F}{1,6 \times 10^{-19}} \checkmark$$

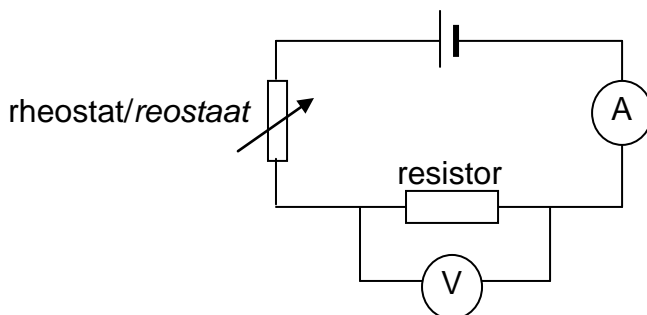
$$F = 8 \times 10^{-14} \text{ N} \checkmark$$

(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. <i>Battery aan resistor geskakel soos getoon – korrekte simbole is gebruik.</i>	✓
Rheostat connected in series with resistor – correct symbols used. <i>Reostaat in serie geskakel met resistor – korrekte simbole is gebruik.</i>	✓
Ammeter connected in series so that it measures the current through resistor – correct symbols used. <i>Ammeter in serie geskakel sodat dit die stroom deur die resistor meet – korrekte simbole is gebruik.</i>	✓
Voltmeter connected in parallel across resistor – correct symbols used. <i>Voltmeter in parallel geskakel oor resistor – korrekte simbole is gebruik.</i>	✓

(4)

9.1.2 Temperature/Temperatuur ✓

(1)

9.1.3 B ✓

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

B ✓

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

OR/OF

B ✓

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

B ✓

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

(3)

9.2

9.2.1
$$\frac{1}{R} = \frac{1}{r_1} + \frac{1}{r_2} \checkmark = \frac{1}{4} + \frac{1}{16} \checkmark$$

$\therefore R = 3,2 \Omega$

$R_{\text{effective/effektief}} = 3,2 \Omega + 2 \Omega + 0,8 \Omega \checkmark$
 $= 6 \Omega \checkmark$

(4)

9.2.2

<p><u>Option 1/Opsie 1:</u> $V = IR \checkmark$ $12 = I(6) \checkmark$ $I = 2 \text{ A} \checkmark$</p>	<p><u>Option 2/Opsie 2:</u> $\text{emf} = I(R + r) \checkmark$ $12 = I(5,2 + 0,8) \checkmark$ $I = 2 \text{ A} \checkmark$</p>
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(3)

9.2.3

<p><u>Option 1/Opsie 1:</u> $V_{\text{parallel}} = IR \checkmark$ $= (2)(3,2) \checkmark$ $= 6,4 \text{ V}$ $V_{8\Omega} = \frac{6,4}{2} \checkmark = 3,2 \text{ V} \checkmark$</p>	<p><u>Option 2/Opsie 2:</u> $V_p = \frac{R_p}{R} \times V \checkmark$ $= \frac{3,2}{6} \checkmark \times 12 \checkmark = 6,4 \text{ V}$ $\therefore V_{8\Omega} = 3,2 \text{ V} \checkmark$</p>
<p><u>Option 3/Opsie 3:</u> $I_{8\Omega} = \frac{4}{20} (2) \checkmark$ $= 0,4 \text{ A}$ $V_{8\Omega} = IR \checkmark$ $= (0,4)(8) \checkmark$ $= 3,2 \text{ V} \checkmark$</p>	<p><u>Option 4/Opsie 4:</u> $\text{emf} = I(R + r) \checkmark$ $12 = IR_{2\Omega} + V_p + Ir$ $12 = (2)(2) + V_p + (2)(0,8) \checkmark$ $V_p = 6,4 \text{ V}$ $V_{8\Omega} = \frac{6,4}{2} \checkmark = 3,2 \text{ V} \checkmark$</p>

(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) $V_{\text{rms/wgk}} = \frac{V_{\text{max/maks}}}{\sqrt{2}}$ ✓

$$230 = \frac{V_{\text{max/maks}}}{\sqrt{2}} \quad \checkmark$$

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

(3)

10.2.2

(b) $P_{\text{ave}} = V_{\text{rms/wgk}} I_{\text{rms/wgk}} \checkmark$

$$2\,000 = (230) I_{\text{rms/wgk}} \checkmark$$

$$I_{\text{rms/wgk}} = 8,70 \text{ A} \checkmark \quad (8,696 \text{ A})$$

(3)
[12]

QUESTION 11/VRAAG 11

11.1 Photoelectric effect/*Foto-elektriese effek* ✓

(1)

11.2

11.2.1 $E = hf \checkmark$

$$= (6,63 \times 10^{-34})(6,16 \times 10^{14}) \checkmark$$

$$= 4,08 \times 10^{-19} \text{ J} \checkmark$$

(3)

11.2.2 $E = W_0 + K \checkmark$

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

$$f_0 = 5,31 \times 10^{14} \text{ Hz} \checkmark$$

(5)

11.3

11.3.1 Increases ✓

More photoelectrons emitted per second ✓

Vermeerder ✓

Meer foto-elektrone vrygestel per sekonde ✓

(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