



education

Department:
Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE/
NASIONALE SENIOR
SERTIFIKAAT**

GRADE/GRAAD 12

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

MEMORANDUM

ADDITIONAL EXEMPLAR/ADDISIONELE MODEL 2008

MARKS/PUNTE: 150

TIME/TYD: 3 hours/uur

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

Learning Outcomes and Assessment Standards Leeruitkomst en Assesseringstandaarde		
LO 1/LU 1	LO 2/LU 2	LO 3/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.</p> <p><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.</p> <p><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.</p> <p><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.</p> <p><i>Kommunikeer en verdedig wetenskaplike argumente duidelik en presies.</i></p>	<p>AS 12.2.1: Define, discuss and explain prescribed scientific knowledge.</p> <p><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.</p> <p><i>Verduidelik en druk voorgeskrewe wetenskaplike beginsels, teorieë, modelle en wette uit deur die verwantskap tussen verskillende feite konsepte in eie woorde aan te dui.</i></p> <p>AS 12.2.3: Apply scientific knowledge in everyday life contexts.</p> <p><i>Pas wetenskaplike kennis in kontekste van die alledaagse lewe toe.</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.</p> <p><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.</p> <p><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 | Work done/ <i>Arbeid of werk verrig</i> ✓ | [12.2.1] | (1) |
| 1.2 | Power/ <i>Drywing</i> ✓ | [12.2.1] | (1) |
| 1.3 | Interference/ <i>Interferensie</i> ✓ | [12.2.1] | (1) |
| 1.4 | Electric field (strength)/ <i>Elektriese veld(sterkte)</i> ✓ | [12.2.1] | (1) |
| 1.5 | Spontaneous emission/ <i>Spontane uitstraling</i> ✓ | [12.2.1] | (1) |
| | | | [5] |

QUESTION 2/*VRAAG 2*

- | | | | |
|-----|-----|----------|------------|
| 2.1 | E ✓ | [12.2.1] | (1) |
| 2.2 | J ✓ | [12.2.3] | (1) |
| 2.3 | H ✓ | [12.2.1] | (1) |
| 2.4 | A ✓ | [12.2.1] | (1) |
| 2.5 | F ✓ | [12.2.1] | (1) |
| | | | [5] |

QUESTION 3/*VRAAG 3*

- | | | | |
|-----|--|----------|-------------|
| 3.1 | True/ <i>Waar</i> ✓✓ | [12.2.2] | (2) |
| 3.2 | False/ <i>Onwaar</i> ✓
... is broader ... ✓ / ... is breër ... | [12.2.2] | (2) |
| 3.3 | False/ <i>Onwaar</i> ✓
... increase the electrostatic force four times/.. <i>verhoog die elektrostatiese krag vier keer</i> ... ✓ | [12.2.2] | (2) |
| 3.4 | False/ <i>Onwaar</i> ✓
... a DC generator produces a <u>pulsating</u> direct current/ ... 'n GS-generator lewer 'n <i>pulserende direkte stroom</i> ✓ | [12.2.1] | (2) |
| 3.5 | True/ <i>Waar</i> ✓✓ | [12.2.1] | (2) |
| | | | [10] |

QUESTION 4/VRAAG 4

4.1	B ✓✓✓	[12.2.2]	(3)
4.2	A ✓✓✓	[12.1.2]	(3)
4.3	B ✓✓✓	[12.2.3]	(3)
4.4	C ✓✓✓	[12.1.3]	(3)
4.5	D ✓✓✓	[12.1.2]	(3)
			[15]

TOTAL SECTION A:/TOTAAL AFDELING A: 35

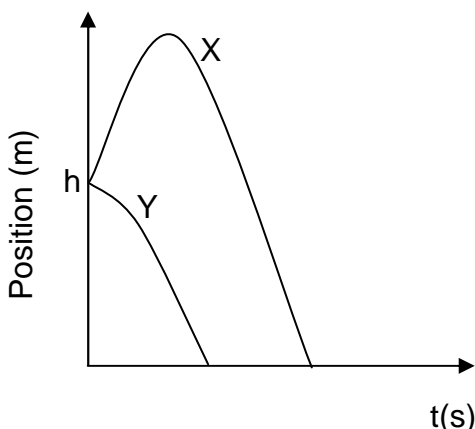
SECTION B/AFDELING B

QUESTION 5/VRAAG 5

- 5.1
- Release a stone from the top of the well and let it fall straight down into the well./Laat val 'n klip vanaf die bopunt van die put reguit in die put in. ✓
 - Take the time from it was released until it splashes in the water./Neem die tyd vandat die klip laat val is totdat dit die water tref. ✓
 - Use the equation $\Delta y = v_i \Delta t + \frac{1}{2} a \Delta t^2$ ✓ with $v_i = 0$ to calculate the depth of the water level./Gebruik die vergelyking $\Delta y = v_i \Delta t + \frac{1}{2} a \Delta t^2$ met $v_i = 0$ om die diepte van die watervlak te bereken. [12.1.1] (3)

- 5.2 Due to air friction gravity is not the only force acting on the object./Weens lugweerstand is gravitasie nie die enigste krag wat op die voorwerp inwerk nie. ✓ [12.2.3] (1)

5.3.1



Checklist/Kontrolelys		Marks/ Punte
Criteria for graph/Kriteria vir grafiek:		
Both graphs starts at height h or same height/Beide grafieke begin by hoogte h of by dieselfde hoogte		✓
Shape of graph X as indicated/Vorm van grafiek X korrek aangedui		✓
Shape of graph Y as indicated/ Vorm van grafiek Y korrek aangedui		✓
Time on x-axis for X longer than for Y/Tyd op x-as vir X langer as vir Y		✓

[12.1.2] (4)

5.3.2 Velocities will be the same/*Snelhede sal dieselfde wees.* ✓

Both X and Y experience the same displacement ✓ and same acceleration. ✓ On its downward flight X has same velocity as Y at a height of h. ✓

Using $v_f^2 = v_i^2 + 2a\Delta y$ will thus give the same final velocity for both.

Beide X en Y ondergaan dieselfde verplasing. ✓ en ondervind dieselfde versnelling. ✓ Op sy afwaarde vlug het X dieselfde snelheid as Y op hoogte h. ✓ Deur gebruik te maak van $v_f^2 = v_i^2 + 2a\Delta y$ sal beide dus dieselfde eindsnelheid hê.

[12.1.4] (4)

5.4 For X - upward as negative/*Vir X - opwaarts as negatief.*

$$v_f^2 = v_i^2 + 2a\Delta y = (2)^2 + 2(9,8)(50) = 31,37 \text{ m}\cdot\text{s}^{-1}$$

$$v_f = v_i + a \Delta t \quad \checkmark$$

$$\therefore 31,37 = 2 + 9,8 \Delta t \quad \checkmark$$

$$\therefore \Delta t = 2,997 = 3 \text{ s}$$

For/*Vir* Y:

$$\Delta t = 3 - 1 = 2 \text{ s} \quad \checkmark$$

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

$$\therefore 50 = v_i(2) + 0,5(9,8)(2)^2 \quad \checkmark$$

$$\therefore v_i = 15,2 \text{ m}\cdot\text{s}^{-1} \text{ downward/afwaarts} \quad \checkmark$$

OR/*OF*

For X - upward as negative/*Vir X - opwaarts as negatief.*

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

$$50 = 2 \Delta t + \frac{1}{2} (9,8) \Delta t^2 \quad \checkmark \therefore 4,9 \Delta t^2 + 2 \Delta t - 50 = 0$$

$$\Delta t = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-2 \pm \sqrt{2^2 - 4(4,9)(-50)}}{2(4,9)}$$

$$\therefore \Delta t = 2,997 \text{ s} = 3 \text{ s}$$

For/*Vir* Y:

$$\Delta t = 3 - 1 = 2 \text{ s} \quad \checkmark$$

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

$$\therefore 50 = v_i(2) + 0,5(9,8)(2)^2 \quad \checkmark$$

$$\therefore v_i = 15,2 \text{ m}\cdot\text{s}^{-1} \text{ downward/afwaarts} \quad \checkmark$$

[12.1.3]

(6)
[18]

QUESTION 6/VRAAG 6

- 6.1 When the airbag inflates during a collision, the contact time of a passenger/driver with an air bag is longer than without an airbag ✓ and thus the force on the passenger/driver is reduced ✓ according to

$$F_{\text{net}} = \frac{\Delta p}{\Delta t} \checkmark.$$

Wanneer die lugsak opblaas tydens 'n botsing, is die kontaktyd van die passasier/bestuurder met 'n lugsak langer as sonder 'n lugsak ✓ en dus is die krag op die passasier/bestuurder kleiner ✓ volgens $F_{\text{net}} = \frac{\Delta p}{\Delta t} \checkmark.$ [12.3.2] (3)

- 6.2.1 Take to the right as negative/Neem na regs as negatief.

$$F_{\text{net}} \Delta t = \Delta p = mv_f - mv_i \checkmark$$

$$\therefore F_{\text{net}} \Delta t = 1,2 \times 10^3 (-2 - 12) \checkmark = -1,68 \times 10^4$$

\therefore Impulse = $1,68 \times 10^4$ N·s ✓ to the right/na regs or/of away from wall/weg vanaf muur ✓

OR/OF

$$v_f = v_i + a \Delta t$$

$$\therefore -2 = 12 + a(0,1)$$

$$\therefore a = -140 \text{ m}\cdot\text{s}^{-2}$$

$$\therefore = 140 \text{ m}\cdot\text{s}^{-2} \text{ to the right/na regs}$$

$$\therefore F_{\text{net}} = ma = (1,2 \times 10^3)(-140) \checkmark = -1,68 \times 10^5$$

$$\therefore F_{\text{net}} = 1,68 \times 10^5 \text{ N to the right/na regs or/of away from wall/weg vanaf muur}$$

$$\begin{aligned} \text{Impulse} &= F_{\text{net}} \Delta t \checkmark = (1,68 \times 10^5)(0,1) \checkmark \\ &= 1,68 \times 10^4 \text{ N}\cdot\text{s} \checkmark \text{ to the right/na regs or/of away from wall/weg vanaf muur} \checkmark \end{aligned}$$

[12.2.3] (4)

- 6.2.2 $F_{\text{net}} \Delta t = \Delta p = -1,68 \times 10^4$
 $\therefore F_{\text{net}}(0,1) = -1,68 \times 10^4 \checkmark$
 $\therefore F_{\text{net}} = -1,68 \times 10^5 \text{ N}$
 $\therefore F_{\text{net}} = 1,68 \times 10^5 \text{ N} \checkmark \text{ to the right/na regs} \checkmark$

OR/OF

Take to the right as negative:

$$v_f = v_i + a \Delta t$$

$$\therefore -2 = 12 + a(0,1) \therefore a = -140 \text{ m}\cdot\text{s}^{-2}$$

$$\therefore F_{\text{net}} = ma = (1,2 \times 10^3)(-140) \checkmark = -1,68 \times 10^5$$

$$\therefore F_{\text{net}} = 1,68 \times 10^5 \text{ N} \checkmark \text{ to the right/na regs} \checkmark \text{ or/of away from the wall/weg van die muur af}$$

[12.2.3] (3)

- 6.3 Decreases/Neem af ✓

The final velocity of the car is zero and thus Δp decreases ✓

Die finale snelheid van die motor is nul en dus neem Δp af. ✓

[12.2.2] (2)

[12]

QUESTION 7/VRAAG 7

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

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.

[12.2.1] (2)

- 7.2 $(E_p + E_k)_f = (E_p + E_k)_i$
 $mgh_f + \frac{1}{2}mv_f^2 = mgh_i + \frac{1}{2}mv_i^2$ ✓
 $m(9,8)(5) + 0 = m(9,8)(1,3) + \frac{1}{2}mv_i^2$ ✓
 $v_i = 8,52 \text{ m}\cdot\text{s}^{-1}$ ✓

OR/OF

$$W_{\text{net}} = \Delta E_k = E_{kf} - E_{ki} \text{ ✓}$$

(Work done is only due to gravity/arbeid verrig slegs deur gravitasie)

$$W_{\text{net}} = F \cos \theta \Delta y = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2$$

$$\therefore mg \cos 180^\circ (h_f - h_i) = 0 - \frac{1}{2}mv_i^2 \text{ ✓}$$

[$E_{kf} = 0$, v_f at highest point is zero/by hoogste punt is nul]

$$\therefore m(9,8) \cos 180^\circ (5 - 1,3) = - \frac{1}{2}mv_i^2 \text{ ✓}$$

$$\therefore m(9,8)(-1)(3,7) = - \frac{1}{2}mv_i^2$$

$$\therefore v_i = 8,52 \text{ m}\cdot\text{s}^{-1} \text{ ✓}$$

OR/OF

$$W(\text{external forces/eksterne kragte}) = \Delta E_p + \Delta E_k \text{ ✓}$$

$$0 = mg(h_f - h_i) + \left(\frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2\right) \text{ ✓}$$

$$\therefore -mg(h_f - h_i) = - \frac{1}{2}mv_i^2$$

$$\therefore -m(9,8)(5 - 1,3) = - \frac{1}{2}mv_i^2 \text{ ✓}$$

$$v_i = 8,52 \text{ m}\cdot\text{s}^{-1} \text{ ✓}$$

[12.1.3] (5)
[7]

QUESTION 8/VRAAG 8

8.1 Doppler effect/Doppler-effek ✓

A change in observed frequency (pitch) due to relative motion between observer and sound source./'n Verandering in waargenome frekwensie (toonhoogte) wanneer daar relatiewe beweging tussen 'n klankbron en 'n waarnemer is. ✓✓

OR/OF

A change in observed frequency (pitch) because the sound source and observer have different velocities with respect to the medium./ 'n Verandering in waargenome frekwensie (toonhoogte) omdat die bron en die waarnemer verskillende snelhede ten opsigte van die medium het. ✓✓

[12.2.1] (3)

8.2

$$f_L = \frac{v \pm v_L}{v \pm v_s} f_s \quad \checkmark$$

When car approaches/Wanneer motor nader beweeg:

$$f_L (\text{approach/nader}) = \left(\frac{340 + v_L}{340 \pm 0} \right) 700 \quad \checkmark$$

When car moves away/Wanneer motor weg beweeg:

$$f_L (\text{away/weg}) = \left(\frac{340 - v_L}{340 \pm 0} \right) 700 \quad \checkmark$$

$$\left(\frac{340 + v_L}{340 \pm 0} \right) 700 - \left(\frac{340 - v_L}{340 \pm 0} \right) 700 = 80 \quad \checkmark$$

$$\therefore \frac{700}{340} (340 + v_L - 340 + v_L) = 80$$

$$\therefore v_L = 19,43 \text{ m}\cdot\text{s}^{-1} \quad \checkmark$$

OR/OF

$$f_L = \frac{v \pm v_L}{v \pm v_s} f_s \quad \checkmark$$

$$f_L (\text{approach/nader}) = \left(\frac{v + v_L}{v \pm 0} \right) f_s \quad \checkmark$$

$$f_L (\text{away/weg}) = \left(\frac{v - v_L}{v \pm 0} \right) f_s \quad \checkmark$$

$$f_L (\text{approach/nader}) - f_L (\text{away/weg}) = \left(\frac{v + v_L}{v \pm 0} \right) f_s - \left(\frac{v - v_L}{v \pm 0} \right) f_s = 80 \quad \checkmark$$

$$\therefore 80 = \frac{2f_s v_L}{v} = \frac{2(700)v_L}{340}$$

$$\therefore v_L = 19,43 \text{ m}\cdot\text{s}^{-1} \quad \checkmark$$

[12.1.3] (5)
[8]

QUESTION 9/VRAAG 9

9.1 Diffraction/Diffraksie ✓ [12.1.2] (1)

9.2 Wavelets originating from different points in the slit ✓ reach the screen out of phase and interfere destructively ✓ on the screen.

Golffronte wat vanaf verskillende punte in die spleet ontstaan ✓ bereik die skerm uit fase en ondergaan destruktiewe interferensie. ✓ [12.2.3] (2)

9.3
$$\sin \theta = \frac{m\lambda}{a} \checkmark$$
$$= \frac{(1)(675 \times 10^{-9})}{1,8 \times 10^{-4}} \checkmark$$
$$= 3,75 \times 10^{-3}$$
$$\therefore \theta = 0,21^\circ \checkmark$$

$$\tan 0,21^\circ = \frac{y}{0,4} \checkmark$$
$$\therefore y = 1,47 \times 10^{-3} \text{ m (1,47 mm)} \checkmark$$

Width of central bright band/Breedte van sentrale helder band:
 $2y = 2(1,47 \times 10^{-3}) = 2,93 \times 10^{-3} \text{ m (2,93 mm)} \checkmark$ [12.1.3] (6)

9.4 Increases/Toeneem ✓

Diffraction is inversely proportional to the width of the slit. ✓✓
Diffraksie is omgekeerd eweredig aan die breedte van die spleet. ✓✓ [12.2.2]

OR/OF

Amount of diffraction is determined by the ratio $\frac{\lambda}{a}$ ✓. If a decreases, $\frac{\lambda}{a}$ will increase. ✓/Hoeveelheid diffraksie word bepaal deur die verhouding $\frac{\lambda}{a}$ ✓. Indien a afneem, sal $\frac{\lambda}{a}$ toeneem ✓. (3)

9.5 Red/Rooi ✓

The yellow filter transmits red light. ✓ – yellow only transmits red and green light. When the red light reaches the magenta filter it will be transmitted ✓ – magenta only transmits red and blue light.

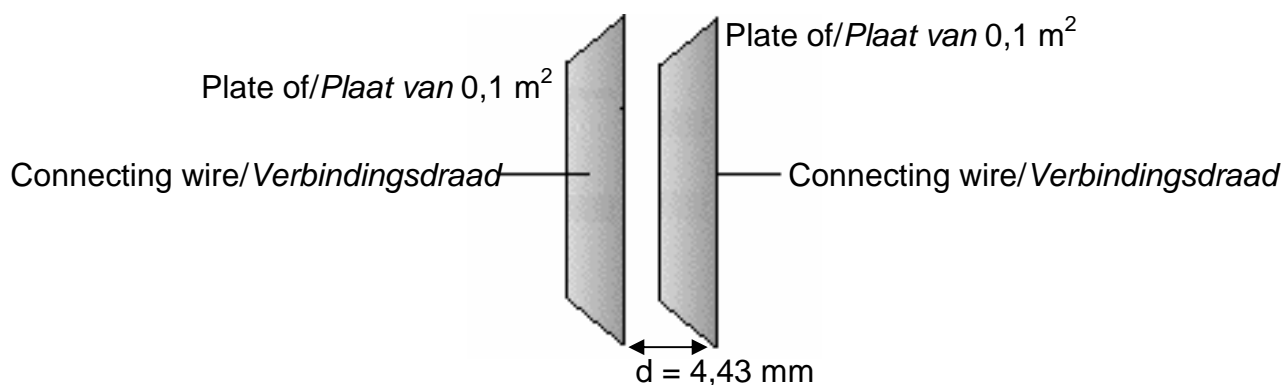
Die geel filter laat rooi lig deur ✓ – geel laat slegs rooi en groen lig deur. Wanneer die rooi lig die magenta filter bereik, word dit deurgelaat ✓ – magenta laat slegs rooi en blou lig deur. [12.2.3] (3)
[15]

QUESTION 10/VRAAG 10

10.1 As the capacitor charges the direct current decreases ✓ and eventually becomes zero when the capacitor is fully charged. ✓
Soos wat die kapasitor laai, verminder die direkte stroom ✓ en word uiteindelik nul wanneer die kapasitor ten volle gelaai is. ✓ [12.2.3] (2)

10.2.1 Plate area/Plaatoppervlakte = $\frac{0,2}{2} = 0,1 \text{ m}^2$ ✓
 $C = \frac{\epsilon_0 A}{d}$ ✓
 $\therefore 200 \times 10^{-12} = 8,85 \times 10^{-12} \frac{0,1}{d}$ ✓
 $\therefore d = 4,43 \times 10^{-3} \text{ m (4,43 mm)}$ ✓ [12.1.3] (4)

10.2.2



Checklist/Kontrolelys	Marks/Punte
Criteria for diagram/Kriteria vir diagram:	
Plates drawn parallel/Plate parallel geteken	✓
Area of plates indicated/Oppervlakte van plate aangedui	✓
Connecting wires indicated and labelled/Verbindingsdrade aangedui en benoem	✓
Distance between plates indicated/Afstand tussen plate aangedui	✓

[12.1.1] (4)

10.2.3 Double the distance between the plates/Increase the distance between the plates to 8,86 mm ✓
Verdubbel die afstand tussen die plate/Vermeerder die afstand tussen die plate na 8,86 mm ✓ [12.2.2] (1)

10.3.1 Batteries store energy in chemical reactions/Batterie stoor energie in chemiese reaksies ✓
Capacitors store energy in electric fields/Kapasitors stoor energie in elektriese velde ✓ [12.2.1] (2)

- 10.3.2 Any one/*Enigeen*:
Chemicals e.g. acid or heavy metals can leach into soil and groundwater./*Chemikalieë bv. suur of swaar metale kan in grondwater en grond inbeweeg.* ✓
Plastic casing can pollute environment./*Plastiekomhulsels kan die omgewing besoedel.* [12.3.3] (1)
- 10.3.3 Capacitors need a source of energy e.g. batteries to obtain charge. ✓
Batteries produce their own energy/electricity from chemical reactions inside the battery. ✓
Kapasitors benodig 'n bron van energie bv. batterye om lading te verkry. ✓ *Batterye produseer hulle eie energie/elektrisiteit uit chemiese reaksies binne-in die battery.* ✓ [12.1.4] (2)
[16]

QUESTION 11/VRAAG 11

- 11.1 The maximum work done per unit charge/*Maksimum arbeid verrig per eenheidslading* ✓✓ [12.2.1] (2)
- 11.2 $\frac{1}{R_p} = \frac{1}{4} + \frac{1}{6}$ ✓ $\therefore R_p = 2,4 \Omega$ ✓
 $R(\text{total}/\text{totaal}) = 2,4 + 6 + 10 + 2 = 20,4 \Omega$ ✓
 $I = \frac{V}{R}$ ✓ = $\frac{30}{20,4}$ ✓ = 1,47 A
 $V_p = IR_p = (1,47)(2,4)$ ✓ = 3,53 V ✓ [12.1.3] (7)
[9]

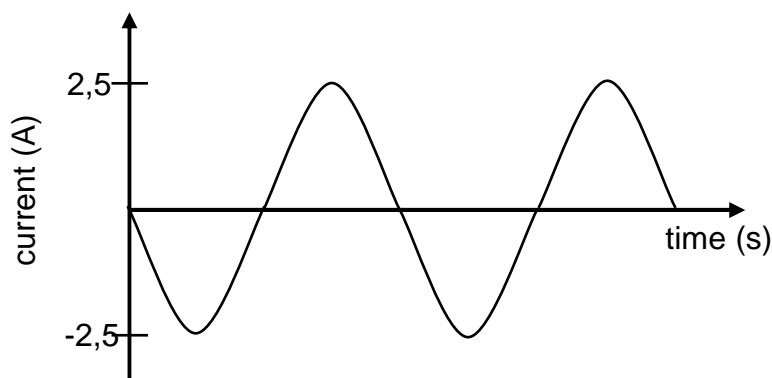
QUESTION 12/VRAAG 12

12.1 $V_{\text{rms}} = \frac{V_{\text{max}}}{\sqrt{2}} \checkmark = \frac{12}{\sqrt{2}} \checkmark = 8,49 \text{ V} \checkmark$ [12.2.3] (3)

12.2 $P_{\text{ave}} = V_{\text{rms}} I_{\text{rms}} \checkmark \therefore 15 = 8,49 I_{\text{rms}} \checkmark \therefore I_{\text{rms}} = 1,77 \text{ A}$

$I_{\text{rms}} = \frac{I_{\text{max}}}{\sqrt{2}} \therefore I_{\text{max}} = 1,77 \sqrt{2} \checkmark = 2,5 \text{ A} \checkmark$ [12.2.3] (4)

12.3



Checklist/Kontrolelys		Marks/ Punte
Criteria for graph/ <i>Kriteria vir grafiek:</i>		
Axes drawn and correctly labelled./ <i>Asse geteken en korrek benoem.</i>		✓
Shape of graph as indicated./ <i>Vorm van grafiek soos getoon.</i>		✓
Peak current correctly indicated on y-axis/ <i>Kruinstroom korrek op y-as aangedui.</i>		✓

[12.1.2] (3)
[10]

QUESTION 13/VRAAG 13

- 13.1 DC generator/GS-generator ✓
Split-ring commutator ✓ present/*Splitringkommutator teenwoordig* [12.1.2] (2)
- 13.2 Decrease/*afneem* ✓ as the coil rotates clockwise from the vertical to the horizontal position/*soos wat spoel kloksgewys vanaf die vertikale na horisontale posisie roteer.*
- When the coil is in the vertical position in the diagram, the magnetic flux linkage is a minimum, ✓ but the change in flux linkage with time is a maximum and thus the induced potential difference in the coil is a maximum. ✓
- In the horizontal position the magnetic flux linkage is maximum, ✓ but the change in magnetic flux linkage with time is now a minimum, thus the induced potential difference in the coil is a minimum. ✓
- Wanneer die spoel in die vertikale posisie in die diagram is, is die magneetvloedkoppeling 'n minimum, ✓ maar die verandering in vloedkoppeling met tyd is 'n maksimum en dus is die geïnduseerde potensiaalverskil in die spoel 'n maksimum. ✓
- Sodra die spoel die horisontale posisie in die diagram bereik, is die magneetvloedkoppeling 'n maksimum, ✓ maar die verandering in vloedkoppeling met tyd is 'n minimum en dus is die geïnduseerde potensiaalverskil in die spoel 'n minimum. ✓ [12.1.2] [12.2.3] (5)
- 13.3 Any ONE/*Enige EEN*:
Increase the number of wire loops in the coil/*Verhoog aantal windinge in spoel*. ✓
Use a stronger magnet/*Gebruik 'n sterker magneet*
Rotate the coil faster/*Roteer die spoel vinniger* [12.2.3] (1)
[8]

QUESTION 14/VRAAG 14

14.1 Minimum energy needed to eject electrons from a certain material/metal. ✓✓

Minimum energie benodig om elektrone uit 'n spesifieke metaal/materiaal vry te stel. ✓✓ [12.2.1] (2)

14.2 $E = \frac{hc}{\lambda}$ ✓

$\therefore 6,9 \times 10^{-19} \text{ J} = \frac{(6,63 \times 10^{-34})(3 \times 10^8)}{\lambda}$ ✓
 $\therefore \lambda = 288,26 \times 10^{-9} \text{ m} = 288,26 \text{ nm}$ [12.2.3] (4)

14.3 $E_k = \frac{hc}{\lambda} - W$ ✓

$= \frac{(6,63 \times 10^{-34})(3 \times 10^8)}{260 \times 10^{-9}} - 6,9 \times 10^{-19}$ ✓
 $= 7,65 \times 10^{-19} - 6,9 \times 10^{-19}$
 $= 7,5 \times 10^{-20} \text{ J}$ ✓ [12.1.3] (4)

14.4 The positively charged zinc plate will attract electrons ✓ preventing them from being emitted. ✓

Die positief gelaaide sinkplaat sal elektrone aantrek ✓ en vrystelling verhoed. ✓ [12.2.3] (2)
[12]

GRAND TOTAL/GROOTTOTAAL: 150