



GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

**PREPARATORY EXAMINATION/
VOORBEREIDENDE EKSAMEN
2014
MEMORANDUM**

SUBJECT/VAK:

**PHYSICAL SCIENCES: PHYSICS (P1)/
FISIESE WETENSKAPPE: FISIKA (V1)
(10841)**

**GAUTENG DEPARTMENT OF EDUCATION/
GAUTENGSE DEPARTEMENT VAN ONDERWYS
PREPARATORY EXAMINATION/
VOORBEREIDENDE EKSAMEN**

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

MEMORANDUM

QUESTION 1/VRAAG 1

1.1	B ✓✓	(2)
1.2	D ✓✓	(2)
1.3	B ✓✓	(2)
1.4	B ✓✓	(2)
1.5	C ✓✓	(2)
1.6	A ✓✓	(2)
1.7	D ✓✓	(2)
1.8	C ✓✓	(2)
1.9	A ✓✓	(2)
1.10	C ✓✓	(2)
		[20]

QUESTION 2/VRAAG 2

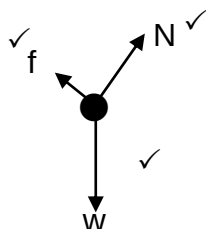
- 2.1 Acceleration is the rate ✓ of change in velocity / ✓
 Versnelling is die tempo ✓ van verandering in snelheid ✓

Acceleration is the change in velocity ✓ per unit time / ✓
 Versnelling is die verandering in snelheid ✓ per eenheid tyd ✓

(2)

2.2 Accepted Labels/Aanvaarde benoemings

- w F_g/F_w /force of Earth on block/weight/49 N/mg/gravitational force
 F_g/F_w /krag van Aarde op blok/gewig/49 N/mg/gravitasiekrag
 N F_N /normal
 F_N /normaal
 f Friction/ F_f
 Wrywing/ F_f

**Note/Nota**

One mark for correct arrow **and** label.

If **any** other forces shown max. $\frac{2}{3}$

Een punt vir die korrekte pyl **en** benaming

Indien **enige** ander krag getoon word maks. $\frac{2}{3}$

(3)

- 2.3 **OPTION 1/OPSIE 1**
 Upward positive:
 Opwaarts positief:
 For/Vir 2 kg

$$F_{\text{net}} = ma \checkmark$$

$$T - F_G = ma$$

$$\checkmark 21 - 19,6 = 2a \checkmark$$

$$a = 0,7 \text{ m} \cdot \text{s}^{-2}$$

- OPTION 2/OPSIE 2**
 Upward negative:
 Opwaarts negatief:
 For/Vir 2 kg

$$F_{\text{net}} = ma \checkmark$$

$$F_G - T = ma$$

$$\checkmark 19,6 - 21 = 2a \checkmark$$

$$a = -0,7 \text{ m} \cdot \text{s}^{-2}$$

$$\therefore a = 0,7 \text{ m} \cdot \text{s}^{-2}$$

(3)

2.4

OPTION 1/OPSIE 1**Parallel down positive:****Parallel af positief:****For/Vir 5 kg**

$$F_{\text{net}} = ma$$

$$F_g \sin \theta - T - f = ma \checkmark$$

$$78,4 \sin 20^\circ - 21 - f = 8(0,7) \checkmark$$

$$f = 0,21 \text{ N} \checkmark$$

OPTION 2/OPSIE 2**Parallel down negative:****Parallel af negatief:****For/Vir 5 kg**

$$F_{\text{net}} = ma$$

$$-F_g \sin \theta + T + f = ma \checkmark$$

$$-78,4 \sin 20^\circ + 21 + f = 8(-0,7) \checkmark$$

$$f = -0,21 \text{ N}$$

$$\therefore f = 0,21 \text{ N} \checkmark$$

Note/NotaAny one of the
two answers.*Enige een van die
twee antwoorde*(4)
[11]

QUESTION 3/VRAAG 3

- 3.1 $9,8 \text{ m} \cdot \text{s}^{-2}$ ✓ downward/to the centre of the earth / ✓
 $9,8 \text{ m} \cdot \text{s}^{-2}$ ✓ afwaarts / na die middelpunt van die aarde ✓ (2)

3.2 **OPTION 1 / OPSIE 1**
 Downward positive:
 Afwaarts positief:
 From t_1 to t_2 / Vanaf t_1 na t_2

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

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

$$\Delta t = 0,43 \text{ s} \checkmark$$

OPTION 3 / OPSIE 3
 Downward positive:
 Afwaarts positief:
 From 0 to t_1 / Vanaf 0 na t_1

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

$$0 = v_i^2 + 2(9,8)(-0,9) \checkmark$$

$$v_i = \pm 4,2 \text{ m} \cdot \text{s}^{-1}$$

$$\therefore v_i = -4,2 \text{ m} \cdot \text{s}^{-1}$$

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

$$0 = -4,2 + (9,8)\Delta t \checkmark$$

$$\Delta t = 0,43 \text{ s} \checkmark$$

OPTION 2 / OPSIE 2
 Downward negative:
 Afwaarts negatief:
 From t_1 to t_2 / Vanaf t_1 na t_2

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

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

$$\Delta t = 0,43 \text{ s} \checkmark$$

OPTION 4 / OPSIE 4
 Downward negative:
 Afwaarts negatief:
 From 0 to t_1 / Vanaf 0 na t_1

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

$$0 = v_i^2 + 2(-9,8)(0,9) \checkmark$$

$$v_i = \pm 4,2 \text{ m} \cdot \text{s}^{-1}$$

$$\therefore v_i = 4,2 \text{ m} \cdot \text{s}^{-1}$$

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

$$0 = 4,2 + (-9,8)\Delta t \checkmark$$

$$\Delta t = 0,43 \text{ s} \checkmark$$

OPTION 5 / OPSIE 5**Downward positive:****Afwaarts positief:****From 0 to t_1 / Vanaf 0 na t_1**

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

$$0 = v_i^2 + 2(9,8)(-0,9) \checkmark$$

$$v_i = \pm 4,2 \text{ m} \cdot \text{s}^{-1}$$

$$\therefore v_i = -4,2 \text{ m} \cdot \text{s}^{-1}$$

$$\Delta y = \frac{v_i + v_f}{2} \Delta t \checkmark$$

$$-0,9 = \frac{-4,2 + 0}{2} \Delta t \checkmark$$

$$\Delta t = 0,43 \text{ s} \checkmark$$

OPTION 6 / OPSIE 6**Downward negative:****Afwaarts negatief:****From 0 to t_1 / Vanaf 0 na t_1**

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

$$0 = v_i^2 + 2(-9,8)(0,9) \checkmark$$

$$v_i = \pm 4,2 \text{ m} \cdot \text{s}^{-1}$$

$$\therefore v_i = 4,2 \text{ m} \cdot \text{s}^{-1}$$

$$\Delta y = \frac{v_i + v_f}{2} \Delta t \checkmark$$

$$0,9 = \frac{4,2 + 0}{2} \Delta t \checkmark$$

$$\Delta t = 0,43 \text{ s} \checkmark$$

(4)

3.3 POSITIVE MARKING FROM QUESTION 3.2 POSITIEWE NASIEN VANAF VRAAG 3.2

OPTION 1 / OPSIE 1**Downward positive:****Afwaarts positief:****From 0 to t_1 / Vanaf 0 na t_1**

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

$$\checkmark 0 = v_i^2 + 2(9,8)(-0,9) \checkmark$$

$$v_i = \pm 4,2 \text{ m} \cdot \text{s}^{-1}$$

$$\therefore v_i = -4,2 \text{ m} \cdot \text{s}^{-1}$$

$$\therefore v_i = 4,2 \text{ m} \cdot \text{s}^{-1} \text{ upward/opwaarts} \checkmark$$

OPTION 1 / OPSIE 1**Downward negative:****Afwaarts negatief:****From 0 to t_1 / Vanaf 0 na t_1**

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

$$\checkmark 0 = v_i^2 + 2(-9,8)(0,9) \checkmark$$

$$v_i = \pm 4,2 \text{ m} \cdot \text{s}^{-1}$$

$$\therefore v_i = 4,2 \text{ m} \cdot \text{s}^{-1} \text{ upward/opwaarts} \checkmark$$

OPTION 3 / OPSIE 3**Downward positive:****Afwaarts positief:****From 0 to t_2 / Vanaf 0 na t_2**

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

$$\checkmark 0,9 = v_i(0,43) + \frac{1}{2}(9,8)(0,43)^2$$

$$v_i = -4,2 \text{ m} \cdot \text{s}^{-1}$$

$$\therefore v_i = 4,2 \text{ m} \cdot \text{s}^{-1} \text{ upward/opwaarts} \checkmark$$

OPTION 4 / OPSIE 4**Downward negative:****Afwaarts negatief:****From 0 to t_2 / Vanaf 0 na t_2**

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

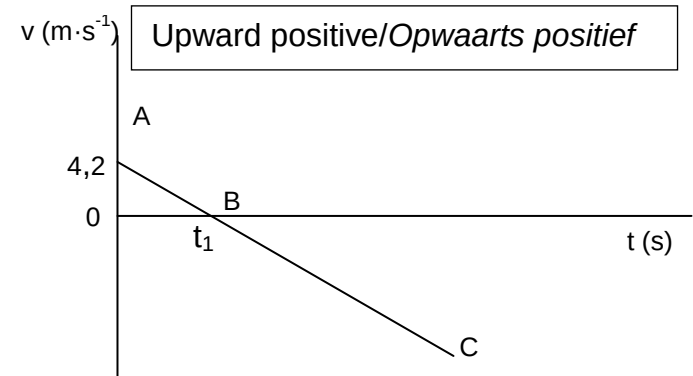
$$\checkmark -0,9 = v_i(0,43) + \frac{1}{2}(-9,8)(0,43)^2$$

$$v_i = 4,2 \text{ m} \cdot \text{s}^{-1}$$

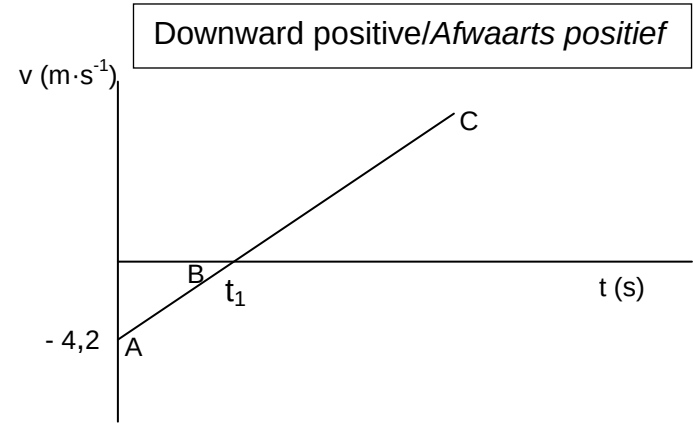
$$\therefore v_i = 4,2 \text{ m} \cdot \text{s}^{-1} \text{ upward/opwaarts} \checkmark$$

(4)

3.4 POSITIVE MARKING FROM QUESTION 3.2 AND 3.3
POSITIEWE NASIEN VANAF VRAAG 3.2 EN 3.3



Criteria for graph/Kriteria vir grafiek:	Marks/Punte
Straight line, crossing x-axis <i>Reguitlyn, kruis die x-as</i>	✓
AB is shorter than BC <i>AB is korter as BC</i>	✓
$v_i = \pm 4,2 \text{ m}\cdot\text{s}^{-1}$	✓
$t_1 = 0,43 \text{ s}$	✓



Note/Nota

if no/incorrect labels on axis: max. $\frac{3}{4}$

as geen/verkeerde benamings vir asse dan: maks. $\frac{3}{4}$

(4)
[14]

QUESTION 4/VRAAG 4

4.1 $F_G = \frac{Gm_z m_x}{d^2} \checkmark$
 $F_G = \frac{(6,67 \times 10^{-11})(5,98 \times 10^{24})(1,99 \times 10^{19})}{(1,496 \times 10^6)^2} \checkmark$
 $F_G = 3,52 \times 10^{21} \text{ N attractive / aantrekkend} \checkmark$
 OR/OF
 $F_G = 3,55 \times 10^{21} \text{ N towards X / na X}$

(4)

4.2 $(3,55 \times 10^{21}) \times 8 = 2,84 \times 10^{22} \text{ N towards moon Y / na maan Y} \checkmark \checkmark$

(2)

4.3 $F_{\text{net}}^2 = F_{\text{MX}}^2 + F_{\text{MY}}^2 \checkmark$
 $F_{\text{net}}^2 = (3,55 \times 10^{21})^2 + (2,84 \times 10^{22})^2$
 $F_{\text{net}} = 2,86 \times 10^{22} \text{ N} \checkmark$

(2)
[8]

QUESTION 5/VRAAG 5

5.1 Impulse = area between graph and x - axis

Impuls = oppervlakte tussen grafiek en x - as

$\text{Impulse} = \frac{1}{2}bh + \frac{1}{2}bh + lb \checkmark$

$\text{Impulse} = \frac{1}{2}(2)(10) + \frac{1}{2}(2)(-10) + (6)(-10) \checkmark$

$\text{Impulse} = -60 \text{ N} \cdot \text{s} \checkmark$

$\therefore \text{Impulse} = 60 \text{ N} \cdot \text{s} \text{ in oppositedirection/west}$

$\therefore \text{Impuls} = 60 \text{ N} \cdot \text{s} \text{ in teenoorgestelde rigting/wes}$

(3)

5.2 Greater than / Groter as $\checkmark$

(1)

5.3 **OPTION 1 / OPSIE 1**

East positive:

Oos positief:

$\text{Impulse} = mv_f - mv_i \checkmark$

$-60 = (12)v_f - (12)(5,5) \checkmark$

$v_f = 0,5 \text{ m} \cdot \text{s}^{-1} \text{ east/ oos} \checkmark$

OPTION 2 / OPSIE 2

West positive:

Wes positief:

$\text{Impulse} = mv_f - mv_i \checkmark$

$-60 = (12)v_f - (12)(5,5) \checkmark$

$v_f = 0,5 \text{ m} \cdot \text{s}^{-1} \text{ east/ oos} \checkmark$

(4)
[8]

QUESTION 6/VRAAG 6

6.1 $W = F\Delta x \cos \theta$ ✓
 $W = (20)(32) \cos 10^\circ$ ✓
 $W = 630,28 \text{ J}$ ✓

(3)

6.2 OPTION 1 / OPSIE 1

$$F_{\text{net}} = F - F_G \sin \theta - f$$

$$F_{\text{net}} = 20 - 59,78 \sin 10^\circ - 11 \quad \checkmark$$

$$F_{\text{net}} = -1,38 \text{ N}$$

$$F_{\text{net}} = 1,38 \text{ N backwards/agteruit}$$

$$W_{\text{net}} = \Delta E_K \quad \checkmark$$

$$F_{\text{net}} \Delta x \cos \theta = \frac{1}{2} m(v_f^2 - v_i^2) \quad \checkmark$$

$$(1,38)(32) \cos 180^\circ = \frac{1}{2} (6,1)(v_f^2 - 5^2)$$

$$v_f^2 = 10,51$$

$$v_f = 3,24 \text{ m} \cdot \text{s}^{-1} \quad \checkmark$$

Notes/Aantekeninge:

If "net" left out for F_{net} : Max. $\frac{2}{5}$

As "net" uitgelaat is

vir F_{net} : Maks. $\frac{2}{5}$

(5)

OPTION 2 / OPSIE 2

$$W_{\text{net}} = \Delta E_K$$

$$F\Delta x \cos \theta + f\Delta x \cos \theta + F_g \Delta x \cos \theta = \frac{1}{2} m(v_f^2 - v_i^2) \quad \checkmark$$

$$(20)(32) \cos 0^\circ + (11)(32) \cos 180^\circ + (59,78)(32) \cos 10^\circ = \frac{1}{2} (6,1)v_f^2 - \frac{1}{2} (6,1)(5^2) \quad \checkmark$$

$$v_f^2 = 10,51$$

$$v_f = 3,24 \text{ m} \cdot \text{s}^{-1} \quad \checkmark$$

OPTION 3 / OPSIE 3

$$W_{\text{net}} = \Delta E_K \quad \checkmark$$

$$F\Delta x \cos \theta + f\Delta x \cos \theta + F_g \Delta x \cos \theta = \frac{1}{2} m(v_f^2 - v_i^2) \quad \checkmark$$

$$(20)(32) \cos 0^\circ + (11)(32) \cos 180^\circ + (59,78 \sin 10^\circ)(32) \cos 180^\circ = \frac{1}{2} (6,1)v_f^2 - \frac{1}{2} (6,1)(5^2) \quad \checkmark$$

$$v_f^2 = 10,51$$

$$v_f = 3,24 \text{ m} \cdot \text{s}^{-1} \quad \checkmark$$

6.3 The net work done by the non-conservative force / frictional force depends on the path the object travelled ✓✓ /

Die netto arbeid verrig deur 'n nie-konserwatiewe krag / wrywingskrag is onafhanklik van die roete geneem ✓✓

OR/OF

The mechanical energy is not constant ✓✓ for a non-conservative force /

Die meganiese energie is nie konstant ✓✓ vir 'n nie-konserwatiewe krag nie

(2)

QUESTION 7/VRAAG 7

7.1.1 $\Sigma E_{m56m} = \Sigma E_{m18m}$
 $(E_P + E_K)_{56m} = (E_P + E_K)_{18m} \quad \checkmark$
 $mgh + 0 = mgh + \frac{1}{2}mv^2$
 $9,8(56) \checkmark = (9,8)(18) + \frac{1}{2}v^2 \checkmark$
 $v = 27,29 \text{ m} \cdot \text{s}^{-1} \quad \checkmark$

(4)

7.1.2 **POSITIVE MARKING FROM QUESTION 7.1**
POSITIEWE NASIEN VANAF VRAAG 7.1

$f_L = \frac{v \pm v_L}{v \pm v_s} f_s$
 OR/OF
 $f_L = \frac{v}{v - v_s} f_s \quad \checkmark$
 $\checkmark f_L = \left(\frac{340}{340 - 27,29} \right) 497 \times 10^3 \quad \checkmark$
 $f_L = 5,4 \times 10^5 \text{ Hz} \quad \checkmark$

Notes:

- Any other Doppler formula, e.g.

$$f_L = \frac{v + v_L}{v - v_s} f_s - \text{Max. } \frac{3}{4} \text{ for calculation}$$

- Marking rule 1.5: No penalisation if zero substitutions are omitted.

Aantekeninge:

- Enige ander Dopplerformule, bv.

$$f_L = \frac{v + v_L}{v - v_s} f_s - \text{Maks. } \frac{3}{4} \text{ vir berekening}$$

- Nasienreël 1.5: Geen punte word verbeur indien nul substitusies weggelaat word nie.

(4)

7.1.3 The phone is moving away from Keenan who is stationary, the phone is increasing the distance between each wavefront and therefore the wavelength increases $\checkmark$. This causes the frequency to decrease $\checkmark$ since $f \propto \frac{1}{\lambda}$ for the same speed of sound $\checkmark$ /

Die selfoon beweeg weg van Keenan af, die foon vergroot dus die grootte van die afstand tussen die golf fronte en die golflengte vergroot. $\checkmark$ Dit veroorsaak dat die frekwensie afneem $\checkmark$ aangesien $f \propto \frac{1}{\lambda}$ vir dieselfde spoed van klank. $\checkmark$

(3)

7.1.4 HIGHER; $\checkmark$ /
 HOËR $\checkmark$

(1)

7.2 7.2.1 The observed frequency is the same as the original frequency of the source. $\checkmark$ / the car is moving perpendicular to the camera /
Die waargenome frekwensie is dieselfde as die oorspronklike frekwensie van die bron $\checkmark$ / die motor beweeg loodreg ten opsigte van die kamera.

(1)

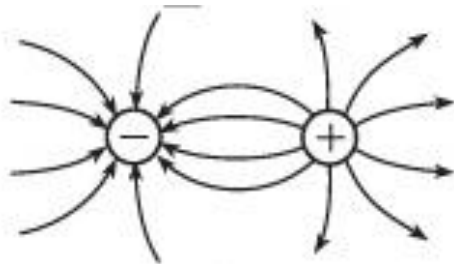
7.2.2 $3 \times 10^8 \text{ m} \cdot \text{s}^{-1} \quad \checkmark$
 It is an electromagnetic wave. $\checkmark$ /
 Dit is 'n elektromagnetiese golf. $\checkmark$

(2)

[15]

QUESTION 8/VRAAG 8

8.1



Criteria for sketch <i>Kriteria vir skets</i>	Marks <i>Punte</i>
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)

8.2

$$F_{B \text{ on } A} = \frac{kQ_A Q_B}{r^2} \checkmark$$

$$F_{B \text{ on } A} = \frac{(9 \times 10^9)(4,5 \times 10^{-5})(9,5 \times 10^{-5})}{(0,35)^2} \checkmark$$

$$F_{B \text{ on } A} = 314,08 \text{ N to the right / na regs} \checkmark$$

(4)

8.3

POSITIVE MARKING FROM QUESTION 8.2
POSITIEWE NASIEN VANAF VRAAG 8.2

Option 1/Opsie 1

$$E_A = \frac{kQ_A}{r^2} \checkmark$$

$$E_A = \frac{(9 \times 10^9)(4,5 \times 10^{-5})}{(0,35)^2} \checkmark$$

$$E_A = 3,31 \times 10^6 \text{ N} \cdot \text{C}^{-1} \text{ to the right / na regs} \checkmark$$

Option 2/Opsie 2

$$E_A = \frac{F_{A \text{ on } B}}{q_B} \checkmark$$

$$E_A = \frac{314,08}{9,5 \times 10^{-5}} \checkmark$$

$$E_A = 3,31 \times 10^6 \text{ N} \cdot \text{C}^{-1} \text{ to the right / na regs} \checkmark$$

(3)
[10]

QUESTION 9 / VRAAG 9

9.1

Criteria for hypothesis / Kriteria vir hipotese:**Mark/
Punt**The dependent and independent variables are stated.*Die afhanklike en onafhanklike veranderlikes is genoem.*

✓

Makes a statement about the relationship between dependent and independent variables.*Maak 'n stelling oor die verwantskap tussen die afhanklike en onafhanklike veranderlikes.*

✓

Independent variable / Onafhanklike veranderlike:

Amount of potato cells / Aantal aartappelselle

Dependent variable / Afhanklike veranderlike:

Bulb glows or not / Gloeilampie gloei of nie

Or/of

Current (strength) / Stroom (sterkte)

Examples / Voorbeelde:

More potato cells will increase the brightness of the bulb/

Meer aartappelselle sal die helderheid van die gloeilampie laat toeneem.

More potato cells will increase the current through the bulb/

*Meer aartappelselle sal die grootte van die stroom deur die gloeilampie laat toeneem.***Notes/****Aantekeninge:**

A statement that does not contain a relationship: Max ½

*'n Stelling wat geen verwantskap bevat nie: Maks. ½***Example/****Voorbeeld:**

Three potato cells are needed to make penlight bulb glow. ½

Drie aartappelselle is nodig om die gloeilampie te laat gloei. ½

(2)

9.2 **Dependent variable / Afhanklike veranderlike:**

Bulb glows or not / Gloeilampie gloei of nie ✓

Or/of

Current (strength) / Stroom (sterkte) ✓

(1)

9.3 1,6 V ✓

(1)

9.4 The battery has an internal resistance / ✓*Die battery het 'n interne weerstand ✓*

(1)

9.5
$$P = \frac{V^2}{R} \quad \checkmark$$

$$P = \frac{(0,02)^2}{2} \quad \checkmark$$

$$P = 2 \times 10^{-4} \text{ W} \quad \checkmark$$

(3)

[8]

QUESTION 10/VRAAG 10

- 10.1 The potential difference is directly proportional to the current ✓ through the resistor if the temperature stays the same. ✓
Die potensiaalverskil is direk eweredig aan die stroomsterkte ✓ deur die resistor, mits die temperatuur konstant bly ✓ vir die resistor. (2)

10.2 $R_1 = \frac{V}{I}$ ✓
 $R_1 = \frac{12,9}{1,5}$ ✓
 $R_1 = 8,6 \Omega$ ✓ (3)

- 10.3 **POSITIVE MARKING FROM QUESTION 11.2**
POSITIEWE NASIEN VAN VRAAG 11.2

$$\frac{1}{R_{\text{tot}}} = \frac{1}{R_1} + \frac{1}{R_{\text{series}}} \quad \checkmark$$

$$\frac{1}{R_{\text{tot}}} = \frac{1}{8,6} + \frac{1}{(4+5)} \quad \checkmark$$

$$\frac{1}{R_{\text{tot}}} = \frac{88}{387}$$

$$R_{\text{tot}} = 4,4 \Omega \quad \checkmark \quad (3)$$

- 10.4 **POSITIVE MARKING FROM QUESTION 11.3**
POSITIEWE NASIEN VAN VRAAG 11.3

Option 1/Opsie 1:

$$I_{\text{total}} = \frac{V}{R_{\text{total}}} \quad \checkmark$$

$$I_{\text{total}} = \frac{12,9}{4,4} \quad \checkmark$$

$$I_{\text{total}} = 2,93 \text{ A}$$

$$r = \frac{V_{\text{lost}}}{I}$$

$$r = \frac{15 - 12,9}{2,93} \quad \checkmark$$

$$r = 0,72 \Omega \quad \checkmark$$

Option 2/Opsie 2:

$$I_{\text{total}} = \frac{V}{R_{\text{total}}} \quad \checkmark$$

$$I_{\text{total}} = \frac{12,9}{4,4} \quad \checkmark$$

$$I_{\text{total}} = 2,93 \text{ A}$$

$$\varepsilon = IR + Ir$$

$$15 = (2,93)(4,4) + (2,93)r \quad \checkmark$$

$$r = 0,72 \Omega \quad \checkmark$$

Option 3/Opsie 3:

$$I_{\text{serie}} = \frac{V}{R_{\text{serie}}} \quad \checkmark$$

$$I_{\text{serie}} = \frac{12,9}{9} \quad \checkmark$$

$$I_{\text{serie}} = 1,43 \text{ A}$$

$$I_{\text{total}} = 1,5 + 1,43$$

$$I_{\text{total}} = 2,93 \text{ A}$$

$$r = \frac{V_{\text{lost}}}{I}$$

$$r = \frac{15 - 12,9}{2,93} \quad \checkmark$$

$$r = 0,72 \, \Omega \quad \checkmark$$

Option 4/Opsie 4:

$$I_{\text{serie}} = \frac{V}{R_{\text{serie}}} \quad \checkmark$$

$$I_{\text{serie}} = \frac{12,9}{9} \quad \checkmark$$

$$I_{\text{serie}} = 1,43 \text{ A}$$

$$I_{\text{total}} = 1,5 + 1,43$$

$$I_{\text{total}} = 2,93 \text{ A}$$

$$\varepsilon = IR + Ir$$

$$15 = (2,93)(4,4) + (2,93)r$$

$$r = 0,72 \, \Omega$$

(4)
[12]

QUESTION 11/VRAAG 11

- 11.1 11.1.1 DC; $\checkmark$ It is powered by a DC-source $\checkmark$
 GS; $\checkmark$ Dit word aangedryf deur 'n GS-bron $\checkmark$ (2)
- 11.1.2
- Increase the emf of the source
 - Increase the amount or turns on the coil
 - Increase the strength of the magnet $\checkmark\checkmark$ [any two]
- Verhoog die emk van die bron
- Vermeerder die aantal windings op die spoel
- Gebruik 'n sterker magneet $\checkmark\checkmark$ [enige twee] (2)
- 11.1.3 X: South pole / Suidpool $\checkmark$
 Y: North pole / Noordpool $\checkmark$ (2)

11.2 11.2.1 **Option 1/Opsie 1:**

$$I_{\text{rms}} = \frac{I_{\text{max}}}{\sqrt{2}} \checkmark$$

$$I_{\text{rms}} = \frac{80}{\sqrt{2}} \checkmark$$

$$I_{\text{rms}} = 56,57 \text{ A} \checkmark$$

$$V_{\text{rms}} = I_{\text{rms}} R$$

$$V_{\text{rms}} = (56,57)(510) \checkmark$$

$$V_{\text{rms}} = 2,89 \times 10^4 \text{ V} \checkmark$$

Option 2/Opsie 2:

$$V_{\text{rms}} = I_{\text{rms}} R$$

$$V_{\text{rms}} = \frac{I_{\text{max}}}{\sqrt{2}} R$$

$$V_{\text{rms}} = \left(\frac{80}{\sqrt{2}}\right)(510) \checkmark$$

$$V_{\text{rms}} = 2,89 \times 10^4 \text{ V} \checkmark$$

(5)

11.2.2 **Option 1/Opsie 1:**

$$P_{\text{ave}} = I_{\text{rms}}^2 R \checkmark$$

$$P_{\text{ave}} = (56,57)^2 (510) \checkmark$$

$$P_{\text{ave}} = 1,63 \times 10^6 \text{ W} \checkmark$$

Option 2/Opsie 2:

$$P_{\text{ave}} = \frac{V_{\text{rms}}^2}{R} \checkmark$$

$$P_{\text{ave}} = \frac{(2,89 \times 10^4)^2}{510} \checkmark$$

$$P_{\text{ave}} = 1,63 \times 10^6 \text{ W} \checkmark$$

(3)

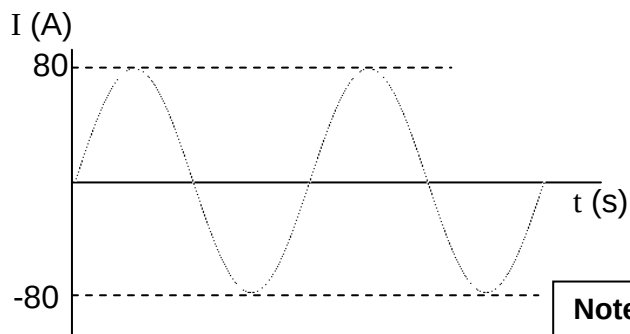
Option 3/Opsie 3:

$$P_{\text{ave}} = V_{\text{rms}} I_{\text{rms}} \checkmark$$

$$P_{\text{ave}} = (2,89 \times 10^4)(56,57) \checkmark$$

$$P_{\text{ave}} = 1,63 \times 10^6 \text{ W} \checkmark$$

11.2.3



Criteria for graph/Kriteria vir grafiek:	Marks/Punte
Sinus or cosines graph <i>Sinus of kosinus grafiek</i>	✓
Two cycles <i>Twee siklusse</i>	✓
Max and min I-values indicated <i>Maks en min I-waardes getoon</i>	✓

Note/Nota

if no/incorrect labels on y-axis: max. $\frac{2}{3}$

as geen/verkeerde benamings vir y-as
dan: maks. $\frac{2}{3}$

(4)
[18]

QUESTION 12/VRAAG 12

- 12.1 12.1.1 Workfunction is the minimum energy of a photon ✓ needed to set an electron free from the surface of a metal ✓ /
Werksfunksie is die minimum energie wat 'n foton ✓ moet hê om 'n elektron vry te stel uit die oppervlak van 'n metaal. ✓ (2)
- 12.1.2 $43,9 \times 10^{-19} \text{ Hz}$ ✓✓ (2)
- 12.1.3 **POSITIVE MARKING FROM QUESTION 13.1.2**
POSITIEWE NASIEN VAN VRAAG 13.1.2

Option 1/Opsie 1:

$$\begin{aligned}
 E &= W_0 + E_k \\
 hf &= hf_0 + \frac{1}{2}mv^2 \quad \left. \vphantom{\begin{aligned} E &= W_0 + E_k \\ hf &= hf_0 + \frac{1}{2}mv^2 \end{aligned}} \right\} \text{Any one/Enige een} \\
 (6,63 \times 10^{-34})(100 \times 10^{-19}) &= (6,63 \times 10^{-34})(43,9 \times 10^{-19}) + \frac{1}{2}(9,11 \times 10^{-31})v^2 \\
 v^2 &= 8,17 \times 10^{-21} \\
 v &= 9,04 \times 10^{-11} \text{ m} \cdot \text{s}^{-1} \quad \checkmark
 \end{aligned}$$

Option 2/Opsie 2:

$$\begin{aligned}
 E &= hf \\
 E &= (6,63 \times 10^{-34})(100 \times 10^{-19}) \\
 E &= 6,63 \times 10^{-51} \text{ J} \\
 W_0 &= hf_0 \\
 W_0 &= (6,63 \times 10^{-34})(43,9 \times 10^{-19}) \\
 W_0 &= 2,91 \times 10^{-51} \text{ J} \\
 E_k &= \frac{1}{2}mv^2 \\
 E - W_0 &= \frac{1}{2}(9,11 \times 10^{-31})v^2 \\
 6,63 \times 10^{-51} - 2,91 \times 10^{-51} &= \frac{1}{2}(9,11 \times 10^{-31})v^2 \\
 v^2 &= 8,17 \times 10^{-21} \\
 v &= 9,04 \times 10^{-11} \text{ m} \cdot \text{s}^{-1} \quad \checkmark
 \end{aligned}$$

(5)

- 12.1.4 The data points are not connected directly, an average straight line connecting most of the points are drawn ✓ /
Die data punte is nie direk verbind nie, 'n gemiddelde reguitlyn wat deur so veel as moontlik punte gaan word geteken. ✓ (1)

- 12.2 12.2.1 Emission spectra occurs when a light source gives off light✓ and absorption spectra occurs when white light is observed through a cold gas✓/
Emissiespektra vorm as 'n ligbron lig afgee✓ terwyl absorpsiespektra vorm as die wit lig waargeneem word deur 'n koue gas. ✓ (2)
- 12.2.2 RED ✓ it has the longest wavelength of all the visible colours✓/
 ROOI ✓ Dit het die langste golflengte van al die sigbare kleure. ✓ (2)
 [14]
 [125]
 150