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* 2013

MEMORANDUM

MARKS/*PUNTE*: 150

This memorandum consists of 18 pages.
Hierdie memorandum bestaan uit 18 bladsye.

SECTION A

QUESTION 1/*VRAAG 1*

1.1   X-rays/*X-strale*✓   (1)

1.2   Momentum ✓   (1)

1.3   Huygens (principle)/*Huygens (se beginsel)*✓   (1)

1.4   ampere/*ampère* ✓   (1)

1.5   Isolated/closed ✓   (1)
            Geïsoleerde/geslote   **[5]**

QUESTION 2/*VRAAG 2*

2.1   B ✓✓   (2)

2.2   A ✓✓   (2)

2.3   A ✓✓   (2)

2.4   D ✓✓   (2)

2.5   A ✓✓   (2)

2.6   D ✓✓   (2)

2.7   B ✓✓   (2)

2.8   A ✓✓   (2)

2.9   B ✓✓   (2)

2.10   C ✓✓   (2)
                                                        [20]

                     TOTAL SECTION A/*TOTAAL AFDELING A*:   **25**

SECTION B/*AFDELING B*

QUESTION 3/*VRAAG 3*

3.1   50 N ✓downwards/*afwaarts*✓   (2)

3.2

3.2.1

OPTION 1/*OPSIE 1* **Downward positive:** *Afwaarts positief:* $v_f^2 = v_i^2 + 2a\Delta y$ ✓ $\therefore v_f^2 = 0^2 + \underline{2(9,8)(0,8)}$ ✓ $\therefore v_f = 3{,}96$ m·s⁻¹ ✓ downward /*afwaarts*✓ **Downward negative:** *Afwaarts negatief:* $v_f^2 = v_i^2 + 2a\Delta y$ ✓ $\therefore v_f^2 = 0^2 + \underline{2(-9,8)(-0,8)}$ ✓ $\therefore v_f = -3{,}96$ m·s⁻¹ $\therefore v_f = 3{,}96$ m·s⁻¹ ✓ downward /*afwaarts*✓	**Notes/***Aantekeninge* Accept/*Aanvaar:* g or/*of* a Accept/*Aanvaar*: $v_f^2 = v_i^2 + 2a\Delta x$ $v^2 = u^2 + 2as$
OPTION 2/*OPSIE 2* $(E_p + E_k)_{top/bo} = (E_p + Ek)_{bottom/onder}$✓ $mgh + 0 = 0 + \tfrac{1}{2}mv^2$ $(9,8)(0,8)$ ✓ $= \tfrac{1}{2} v^2$ $v = 3{,}96$ m·s⁻¹ ✓ downward/*afwaarts*✓	**Notes/***Aantekeninge* Accept/*Aanvaar*: $(U + K)_{top/bo} = (U + K)_{bottom/onder}$

(4)

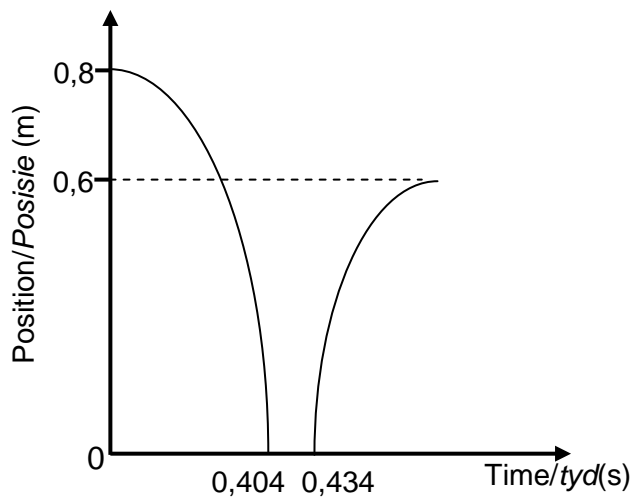| 3.2.2 | **POSITIVE MARKING FROM QUESTION 3.2.1** *POSITIEWE NASIEN VAN VRAAG 3.2.1* **OPTION 1/*OPSIE 1*** **Downward positive/*Afwaarts positief:*** $F_{net}\Delta t = \Delta p$ OR $F_{net}\Delta t = m(v_f - v_i)$ ✓ $(F_{app} + mg)\Delta t = \Delta p$ $(-50 + (0,2)(9,8)\Delta t$ ✓ $= 0,2(-3,43 - 3,96)$ ✓ $\therefore \Delta t = 0,03$ s ✓   (3×10^{-2} s) **Downward negative/*Afwaarts negatief:*** $F_{net}\Delta t = \Delta p$ OR $F_{net}\Delta t = m(v_f - v_i)$ ✓ $(F_{app} + mg)\Delta t = \Delta p$ $(50 - (0,2)(9,8)\Delta t$ ✓ $= 0,2[3,43 - (-3,96)]$ ✓ $\therefore \Delta t = 0,03$ s ✓   (3×10^{-2} s) | **Notes/*Aantekeninge:*** Substitution: F_{app} and v_f must have the same sign. *Substitusie: F_{app} en v_f moet dieselfde tekens hê.* |
| | **OPTION 2/*OPSIE 2*** **Downward positive/*Afwaarts positief:*** $F_{net} = ma$ $F_{app} + mg = ma$ $\underline{(-50 + (0,2)(9,8) = 0,2a}$ ✓ $\therefore a = -240,2$ m·s^{-2} ✓both formulae *beide formules* $v_f = v_i + a\,\Delta t$ $\underline{-3,43 = 3,96 + (-240,2)\Delta t}$ ✓ $\therefore \Delta t = 0,03$ s ✓   (3×10^{-2} s) **Downward negative/*Afwaarts negatief:*** $F_{net} = ma$ $F_{app} + mg = ma$ $\underline{(50 - (0,2)(9,8) = 0,2a}$ ✓ $\therefore a = 240,2$ m·s^{-2} ✓both formulae *beide formules* $v_f = v_i + a\,\Delta t$ $\underline{3,43 = -3,96 + (240,2)\Delta t}$ ✓ $\therefore \Delta t = 0,03$ s ✓   (3×10^{-2} s) | **Notes/*Aantekeninge*** Accept/*Aanvaar*: $v = u + at$ $v_f = v_i + a\,\Delta t$ |

(4)

3.3   **POSITIVE MARKING FROM QUESTION 3.2.**
        POSITIEWE NASIEN VAN VRAAG 3.2.

        <u>**OPTION/*OPSIE 1***</u>
        Ground as zero reference and downward negative:
        Grond as nulverwysing en afwaarts negatief:

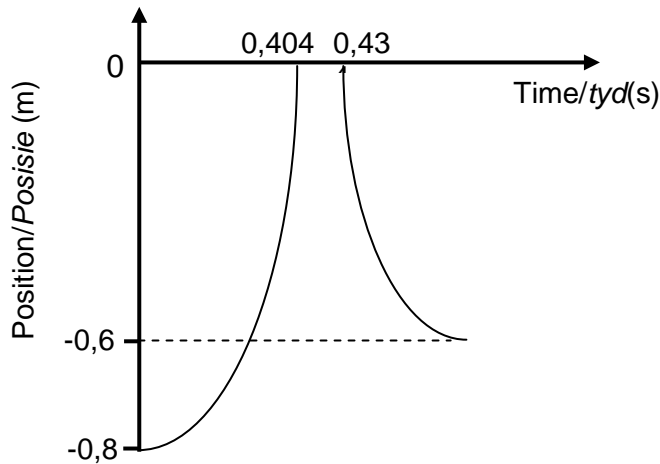| **Criteria for graph/*Kriteria vir grafiek:***	Marks/ *Punte*
Correct shape (both curves) *Korrekte vorm (beide krommes)*	✓
Graph starts at y = 0,8 m at t = 0 s *Grafiek begin by y = 0,8 m at t = 0 s*	✓
Second maximum height at y = 0,6 m *Tweede maksimum by y = 0,6 m s*	✓
Contact time shown as space on x axis between two curves. *Kontaktyd aangetoon as spasie op x-as tussen twee krommes.*	✓
Time at which ball leaves the floor shown as t = 0,434 s. *Tyd wanneer die bal die vloer verlaat getoon as t = 0,434 s.*	✓

OPTION/*OPSIE* 2
Ground as zero reference and downward positive:
Grond as nulverwysing en afwaarts positief:

Criteria for graph/*Kriteria vir grafiek:*	Marks/*Punte*
Correct shape (both curves) *Korrekte vorm (beide krommes)*	✓
Graph starts at y = -0,8 m at t = 0 s *Grafiek begin by y = -0,8 m at t = 0 s*	✓
Second maximum height at y = -0,6 m *Tweede maksimum by y = -0,6 m s*	✓
Contact time shown as space on x axis between two curves. *Kontaktyd aangetoon as spasie op x-as tussen twee krommes.*	✓
Time at which ball leaves the floor shown as t = 0,434 s. *Tyd wanneer die bal die vloer verlaat getoon as t = 0,434 s.*	✓

(5)
[15]

QUESTION 4/*VRAAG 4*

4.1   The <u>total (linear) momentum remains constant</u>/is conserved ✓
in <u>an isolated</u>/a closed system/the absence of external forces. ✓

Die <u>totale lineêre momentum bly konstant</u>/behoue ✓
in 'n <u>geïsoleerde sisteem</u>/geslote sisteem/die afwesigheid van eksterne kragte. ✓

> **Notes/*Aantekeninge:***
> The mark for 'closed/isolated system' is only awarded if used in conjunction with momentum.
> *Die punt vir 'geslote/geïsoleerde sisteem' word slegs toegeken indien saam met momentum gebruik.*
>
> **Accept:** The total momentum before a collision equals the total momentum after a collision in a closed system.
> *Aanvaar: Die totale momentum voor 'n botsing is gelyk aan die totale momentum na 'n botsing in 'n geslote sisteem.*

(2)

4.2   **To the right as positive/*Na regs as positief:***
$\Sigma p_{before/voor} = \Sigma p_{after/na}$ ✓
$\underline{(0,01)(300)}$ ✓ $+ (1,99)(0) = \underline{(0,01 + 1,99)v_{f2}}$ ✓
$\therefore v_{f2} = 1,5 \text{ m·s}^{-1}$ ✓

To the right as negative/*Na regs as negatief:*
$\Sigma p_{before/voor} = \Sigma p_{after/na}$ ✓
$\underline{(0,01)(-300)}$ ✓ $+ (1,99)(0) = \underline{(0,01 + 1,99)v_{f2}}$ ✓
$\therefore v_{f2} = -1,5 \text{ m·s}^{-1}$
$\therefore v_{f2} = 1,5 \text{ m·s}^{-1}$ ✓

Other formulae/*Ander formules*:	**Notes/*Aantekeninge:***
$m_1v_{i1} + m_2v_{i2} = m_1v_{f1} + m_2v_{f2}$ or/*of* $m_1u_1 + m_2u_2 = m_1v_1 + m_2v_2$ or/*of* $m_1v_{i1} + m_2v_{i2} = (m_1 + m_2)v_{f2}$	If no formula/principle – Max. $\dfrac{3}{4}$ *Indien geen formule/beginsel – Maks.* $\dfrac{3}{4}$

(4)

4.3   Inelastic/*Onelasties* ✓
Kinetic energy is not conserved./*Kinetiese energie bly nie behoue nie.*✓

OR/*OF*
Inelastic/*Onelasties*✓
Objects stick together/*Voorwerpe heg aan mekaar.* ✓

OR/*OF*
Inelastic/*Onelasties*✓
Structural damage to the block./*Strukturele skade aan blok.* ✓

OR/*OF*
Inelastic/*Onelasties*✓
There is deformation to the block/bullet./*Daar is vervorming van die blok.*✓

OR/*OF*
Inelastic/*Onelasties* ✓
Energy converted to other forms such as sound and heat./*Energie word omgeskakel na ander vorms soos klank en hitte.*✓

(2)

4.4   **POSITIVE MARKING FROM QUESTION 4.2.**
        POSITIEF NASIEN VAN VRAAG 4.2.

Option 1/*Opsie 1*:	**Notes/*Aantekeninge*:**
$W_{net} = \Delta K$ ✓	Accept/*Aanvaar*:
OR /*OF*	E_k
$F_{net}\Delta x\cos\theta = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2$	
$(8)\Delta x\cos 180°$ ✓ $= \frac{1}{2}(2)(0^2 - 1{,}5^2)$ ✓	
$\therefore \Delta x = 0{,}28$ m ✓	
Option 2/*Opsie 2*:	**Notes/*Aantekeninge*:**
$F_{net} = ma$	Accept/*Aanvaar*:
$\therefore (-8) = 2a$ ✓	$v_f^2 = v_i^2 + 2a\Delta y$
$\therefore a = -4$ m·s^{-2}	$v^2 = u^2 + 2as$
✓Both formulae *Beide formules*	
$v_f^2 = v_i^2 + 2a\Delta x$	
$0^2 = (1{,}5)^2 + 2(-4)\Delta x$ ✓	
$\therefore \Delta x = 0{,}28$ m ✓	

(4)

[12]

QUESTION 5/*VRAAG 5*

5.1   The <u>total mechanical energy remains constant</u>/is conserved✓
        in <u>an isolated</u>/closed system. ✓
        Die <u>totale meganiese energie bly konstant</u>/bly behoue
        in 'n geïsoleerde/geslote sisteem

        OR/*OF*
        The <u>sum of the potential and kinetic energy remains constant</u> ✓
        in <u>an isolated</u>/closed system. ✓
        Die <u>som van die potensiële en kinetiese energies bly konstant</u>
        in 'n geïsoleerde/geslote sisteem
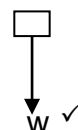
> **Notes/*Aantekeninge*:**
> The mark for 'closed/isolated system' is only awarded if used in conjunction with energy.
> *Die punt vir 'geslote/geïsoleerde sisteem' word slegs toegeken indien saam met energie gebruik.*

(2)

5.2

5.2.1 **Free-body diagram**   **Accept/***Aanvaar***:** Force diagram/*kragtediagram*
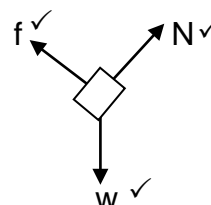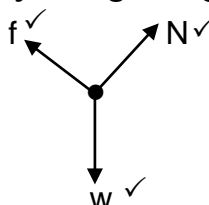   *Vrye kragtediagram*

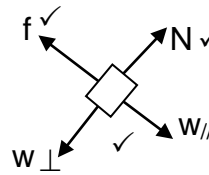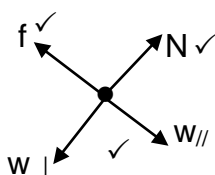|	Accepted labels/*Aanvaarde benoemings*
w	F_g/F_w/force of Earth on boy/weight/392 N/mg/gravitational force *F_g/F_w/krag van Aarde op seun/gewig/392 N/mg/gravitasiekrag*

(1)

5.2.2

Free-body diagram   **Accept: Force diagram**
Vrye kragtediagram   *Aanvaar: Kragtediagram*

OR/*OF*   **OR/***OF*

	Accepted labels/*Aanvaarde benoemings*
w	F_g/F_w/force of Earth on girl/weight/215,6 N/mg/gravitational force *F_g/F_w/krag van Aarde op meisie/gewig/215,6 N/mg/gravitasiekrag*
f	$F_{friction}$/F_f/friction *$F_{wrywing}$/F_f/F_w/wrywing*
N	F_N/F_{normal}/normal force/force of slide or surface on girl

(3)

5.3

$K_i + U_i = K_f + U_f$ ✓ OR $\frac{1}{2}mv_i^2 + mgh_i = \frac{1}{2}mv_f^2 + mgh_f$

$0 + (40)(9,8)(1,5)$ ✓ $= \frac{1}{2}(40)v_f^2 + 0$ ✓

$\therefore v_f = 5,42 \text{ m·s}^{-1}$ ✓

Notes/*Aantekeninge***:**
Accept/*Aanvaar*
E_p & E_k

(4)

5.4	**Option 1/*Opsie 1*** $W_{net} = \Delta K$ ✓ $w\Delta x \cos\theta + f\Delta x \cos\theta = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2$ $mg\Delta x \cos\theta + f\Delta x \cos\theta = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2$ $(22)(9,8)(3)\cos 60° $✓$ + (1,9)(3)\cos 180° $✓$ = \frac{1}{2}(22)(v_f^2 - 0^2)$ ✓ $\therefore v_f = 5,37 \text{ m·s}^{-1}$ ✓	**Accept/** ***Aanvaar:*** $\Delta y/\Delta x$
	Option 2/*Opsie 2* $W_{net} = \Delta K$ ✓ $w_\parallel \Delta x \cos\theta + f\Delta x \cos\theta = ½ mv_f^2 - ½ mv_i^2$ $mg\sin\theta\, x \cos\theta + f\Delta x \cos\theta = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2$ $(22)(9,8)\sin 30°(3)\cos 0° $✓$ + (1,9)(3)\cos 180° $✓$ = \frac{1}{2}(22)(v_f^2 - 0^2)$ ✓ $\therefore v_f = 5,37 \text{ m·s}^{-1}$ ✓	**Accept/** ***Aanvaar***: $\Delta y/\Delta x$
	Option 3/*Opsie 3* $W_{net} = \Delta K$ ✓ $mgh\cos\theta + f\Delta x \cos\theta = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2$ $(22)(9,8)(1,5)\cos 0° $✓$ + (1,9)(3)\cos 180° $✓$ = \frac{1}{2}(22)(v_f^2 - 0^2)$ ✓ $\therefore v_f = 5,37 \text{ m·s}^{-1}$ ✓	**Accept/** ***Aanvaar*** $h/\Delta y/\Delta x$
	Option 4/*Opsie 4* $W_{net} = \Delta K$ ✓ $-\Delta U + W_f = \Delta K$ $-(mgh_f - mgh_i) + W_f = \Delta K$ $-(0 - (22)(9,8)(1,5)$ ✓ $+ (1,9)(3)\cos 180°$✓$ = \frac{1}{2}(22)(v_f^2 - 0^2)$ ✓ $\therefore v_f = 5,37 \text{ m·s}^{-1}$ ✓	**Accept/** ***Aanvaar*** $h/\Delta y/\Delta x$

(5)

5.5   Equal to/*Gelyk aan*✓   (1)

[16]

QUESTION 6/*VRAAG 6*

6.1   The approaching <u>observer</u> (higher f) <u>passes the source</u> at t = 6 s and moves
        away (lower f) from the source. ✓
        *Die naderende <u>waarnemer</u> (hoër f) <u>beweeg verby die bron</u> by t = 6 s en
        beweeg weg (laer f) van die bron af.* (1)

6.2

6.2.1

OPTION 1/*OPSIE 1*	**Notes:**
Approaching observer:	• Any other Doppler formula, e.g.
Naderende waarnemer:	$f_L = \dfrac{v - v_L}{v - v_s}$ - Max. $\dfrac{3}{4}$
$f_L = \dfrac{v \pm v_L}{v \pm v_s} f_s$ **OR/*OF*** $f_L = \dfrac{v + v_L}{v} f_s$ ✓	
$\therefore 900$ ✓ $= \dfrac{340 + v_L}{340}$ ✓ (850) ✓	**_Aantekeninge:_**
$\therefore v_L = 20$ m·s^{-1} ✓	• *Enige ander Dopplerformule, bv.*
OPTION 2 / *OPSIE 2*	$f_L = \dfrac{v - v_L}{v - v_s}$ - *Maks.* $\dfrac{3}{4}$
Observer moving away:	
Waarnemer beweeg weg:	
$f_L = \dfrac{v \pm v_L}{v \pm v_s} f_s$ **OR/*OF*** $f_L = \dfrac{v - v_L}{v} f_s$ ✓	
$\therefore 800$ ✓ $= \dfrac{340 - v_L}{340}$ ✓ (850) ✓	
$\therefore v_L = 20$ m·s^{-1} ✓	

(5)

6.2.2   **POSITIVE MARKING FROM QUESTION 6.2.1**
         POSITIEWE NASIEN van VRAAG 6.2.1

Option 1/*Opsie 1*:	**Notes/*Aantekeninge***
$\Delta x = v_i \Delta t + \frac{1}{2} a \Delta t^2$ ✓	Accept/*Aanvaar*:
$= (20)(6)$ ✓ $+ \frac{1}{2}(0) \Delta t$	$s = ut / s = vt$
$\therefore \Delta x = 120$ m ✓	$s = ut + \dfrac{1}{2} at^2$
Option 2/*Opsie 2*:	$\Delta y = v_i \Delta t + \dfrac{1}{2} a \Delta t^2$
$\Delta x = v \Delta t$ ✓	
$= (20)(6)$ ✓	
$\therefore \Delta x = 120$ m ✓	

(3)
[9]

QUESTION 7/*VRAAG 7*

7.1   B ✓   (1)

7.2   Constructive ✓ interference ✓
        Konstruktiewe interferensie   (2)

7.3

7.3.1

	Notes/*Aantekeninge*
$c = f\lambda$ ✓ $3 \times 10^8 = 4,54 \times 10^{14}\lambda$ ✓ $\therefore \lambda = 6,61 \times 10^{-7}$ m ✓	Accept/*Aanvaar* $v = f\lambda$

(3)

7.3.2   **POSITIVE MARKING FROM QUESTION 7.3.1**
          POSITIEWE NASIEN VAN VRAAG 7.3.1

OPTION 1/*OPSIE 1*	**Notes/*Aantekeninge***
$\tan\theta = \dfrac{\frac{1}{2}\,central\,band}{screen\ distance}$ $\therefore \tan\theta = \dfrac{\frac{1}{2}(0,2)\ ✓}{1,5\ ✓}$ $\therefore \theta = 3,81°$ $\sin\theta = \dfrac{m\lambda}{a}$ ✓ $\sin 3,81°✓ = \dfrac{(1)(6,61\times10^{-7})}{a}$ ✓ $\therefore a = 9,95 \times 10^{-6}$ m ✓	Accept final answer in range: 9,94 x10⁻⁶ to 9,95 x10⁻⁶ m *Aanvaar finale antwoorde in die gebied:* 9,94 x10⁻⁶ to 9,95 x10⁻⁶ m IF distance is not half of central band: Max $\dfrac{4}{6}$ *INDIEN afstand nie helfte van sentrale band is nie: Maks $\dfrac{4}{6}$*
OPTION 2/*OPSIE 2*	**Notes/*Aantekeninge***
$\tan\theta = \dfrac{\frac{1}{2}\,central\,band}{screen\ distance}$ $\therefore \tan\theta = \dfrac{\frac{1}{2}(0,2)\ ✓}{1,5\ ✓}$ $\therefore \theta = 3,81°$ $\sin\theta = \dfrac{m\lambda}{a}$ ✓ $\sin(-3,81°)✓ = \dfrac{(-1)(6,61\times10^{-7})}{a}$ ✓ $\therefore a = 9,95 \times 10^{-6}$ m ✓	Accept final answer in range: 9,94 x10⁻⁶ to 9,95 x10⁻⁶ m *Aanvaar finale antwoorde in die gebied:* 9,94 x10⁻⁶ to 9,95 x10⁻⁶ m IF distance is not half of central band: Max $\dfrac{4}{6}$ *INDIEN afstand nie helfte van sentrale band is nie: Maks $\dfrac{4}{6}$*

(6)

7.4   Decreases/*Verminder* ✓   (1)
                                                                               [13]

QUESTION 8/*VRAAG 8*

8.1   <u>Stores</u> (electric) <u>charge</u>/energy. ✓
        <u>Stoor</u> (elektriese) <u>lading</u>/energie.

        OR/*OF*
        <u>Releases</u> (stored) <u>charge instantly</u>/very fast. ✓
        <u>Stel</u> (gestoorde) <u>lading onmiddellik vry</u>/baie vinnig vry.   (1)

8.2   The brightness of the bulb decreases (gradually) ✓
        until it stops glowing/dies.
        Die helderheid van die gloeilamp verminder (geleidelik).

        OR/*OF*
        The bulb glows dimmer ✓
        until it stops glowing/dies.
        Die gloeilamp gloei flouer totdat dit ophou gloei/uitbrand.   (1)

8.3
8.3.1   0 (V) ✓   (1)

8.3.2   12 V ✓   (1)

8.4   **POSITIVE MARKING FROM QUESTION 8.3.2.**
        POSITIEWE NASIEN VAN VRAAG 8.3.2.
8.4.1 $E = \dfrac{V}{d}$ ✓

        $= \dfrac{12}{5,4 \times 10^{-3}}$ ✓
        $= 2{,}22 \times 10^3$ V·m^{-1} ✓   (2 222,22 V·m^{-1})   (3)

8.4.2   **POSITIVE MARKING FROM QUESTION 8.4.1.**
        POSITIEWE NASIEN VAN VRAAG 8.4.1.
        $E = \dfrac{F}{q}$ ✓

        $\therefore 2{,}22 \times 10^3 = \dfrac{F}{1{,}6 \times 10^{-19}}$ ✓
        $\therefore F = 3{,}56 \times 10^{-16}$ N ✓   (3)

8.5
8.5.1   5,4 mm – 3,8 mm = <u>1,6 mm</u> ✓   (1)

8.5.2   **POSITIVE MARKING FROM QUESTION 8.4.2 & 8.5.1.**
         POSITIEWE NASIEN VAN VRAAG 8.4.2 & 8.5.1.
         W = FΔxcosθ ✓
            = $(3,56 \times 10^{-16})(1,6 \times 10^{-3})$✓cos 0°✓
            = $5,69 \times 10^{-19}$ J ✓

(4)
[15]

QUESTION 9/*VRAAG 9*

9.1

9.1.1   Potential difference/*Potensiaalverskil* ✓   (1)

9.1.2   Temperature/*Temperatuur* ✓
         Resistance/*Weerstand*   (1)

9.1.3   Current is directly proportional to potential difference. ✓✓
         Stroom is direk eweredig aan potensiaalverskil

         OR/*OF*
         The ratio of potential difference to current is constant. ✓✓
         Die verhouding van potensiaalverskil tot stroom is konstant.
         IF/*INDIEN*:
         Current is proportional to potential difference. ✓
         Stroom is eweredig aan potensiaalverskil.   (2)

9.1.4   Gradient/m = $\dfrac{0,18 - 0\ ✓}{0,5 - 0\ ✓}$ = 0,36

         R = $\dfrac{1}{0,36}$ = 2,78 Ω ✓✓

         | **Notes/*Aantekeninge:*** |
         | Accept any set of correct values from the graph. |
         | *Aanvaar enige stel waardes vanaf die grafiek.* |

(4)

9.2

9.2.1 $\dfrac{1}{R_p} = \dfrac{1}{R_1} + \dfrac{1}{R_2}$ ✓

         $= \dfrac{1}{6} + \dfrac{1}{10}$ ✓

         $\therefore R_p = 3,75\ \Omega$ ✓   (3)

9.2.2   **POSITIVE MARKING FROM QUESTION 9.2.1.**
          POSITIEWE NASIEN VAN VRAAG 9.2.1.

OPTION 2 / OPSIE 2	**Notes/Aantekeninge**

$V_p = I_{10\,\Omega}R$
    $= 0{,}6 \times 10$ ✓
    $= 6$ V
$I_p = \dfrac{V_p}{R_p}$
 	
    $= \dfrac{6}{3{,}75}$ ✓
    $= 1{,}6$ A ✓
 	
✓ Any one / *Enige een*
	Do not penalise for subscripts.
	Moenie penaliseer indien onderskrifte weggelaat is nie.

OPTION 1/OPSIE 2	**Notes/Aantekeninge**

$V_{10\,\Omega} = I_{10\,\Omega}R$
    $= 0{,}6 \times 10$ ✓
    $= 6$ V
$I_{6\Omega} = \dfrac{V}{R}$
 	
    $= \dfrac{6}{6}$ ✓
    $= 1$ A
$I_{tot} = 1 + 0{,}6 = 1{,}6$ A ✓
 	
✓ Any one / *Enige een*
	Do not penalise for subscripts.
	Moenie penaliseer indien onderskrifte weggelaat is nie.

(4)

9.2.3   **POSITIVE MARKING FROM QUESTION 9.2.1.**
          POSITIEWE NASIEN VAN VRAAG 9.2.1.

$E = I(R + r)$ ✓
30 ✓ $= 1{,}6(3{,}75 + 5 + 8 + r)$ ✓
$\therefore r = 2\ \Omega$ ✓

(4)

[19]

QUESTION 10/*VRAAG 10*

10.1   Q/split ring commutator/commutator ✓
        Q/splitringkommutator/kommutator   (1)

10.2   <u>Replace Q/split ring commutator</u> <u>with slip rings</u>. ✓
        <u>Vervang Q/splitringkommutator</u> <u>met sleepringe.</u>   (1)

10.3   AC can be <u>stepped-up</u> at power stations/*WS kan by die kragstasie verhoog word* ✓
        to <u>reduce energy loss during transmission</u>./*om energieverlies tydens transmissie te verminder.* ✓   (2)

10.4
10.4.1

	Notes/*Aantekeninge*
$I_{rms/wgk} = \dfrac{I_{max/maks}}{\sqrt{2}}$ ✓ $= \dfrac{0,35}{\sqrt{2}}$ ✓ $\therefore I_{rms/wgk} = 0,25$ A ✓	If subscripts omitted: no mark for formula *Indien onderskifte weggelaat is: geen punt vir formule*

(3)

10.4.2

OPTION 1/*OPSIE 1*	**Notes/*Aantekeninge***
$P_{ave/gemid} = \dfrac{V^2_{rms/wgk}}{R}$ ✓ $60 = \dfrac{240^2}{R}$ ✓ $\therefore R = 960\ \Omega$ ✓	Do not penalise if subscripts are omitted. *Moenie penaliseer indien onderskrifte weggelaat is nie*
OPTION 2/*OPSIE 2* $P_{ave/gemid} = I^2_{rms/wgk}R$ ✓ $60 = (0,25)^2 R$ ✓ $\therefore R = 960\ \Omega$ ✓	
OPTION 3/*OPSIE 3* $R = \dfrac{V_{rms/wgk}}{I_{rms/wgk}}$ ✓ $= \dfrac{240}{0,25}$ ✓ $= 960\ \Omega$ ✓	**Notes/*Aantekeninge*** **Accept/*Aanvaar:*** $R = \dfrac{V}{I}$ as formula/*formule*

(3)

[10]

QUESTION 11/*VRAAG 11*

11.1   Quantum/packet of energy/*Kwantum/pakkie energie*✓
found in light/*In lig gevind* ✓   (2)

11.2
11.2.1

OPTION 1/*OPSIE 1*	
$E = \dfrac{hc}{\lambda}$ ✓ $6,9 \times 10^{-19}$ ✓ $= \dfrac{(6,63 \times 10^{-34})(3 \times 10^{8}) \text{✓}}{\text{✓} \quad \lambda}$ $\therefore \lambda = 2,9 \times 10^{-7}$ m ✓	
OPTION 2 / *OPSIE 2*	**Notes/*Aantekeninge***
$E = hf$ $6,9 \times 10^{-19}$ ✓ $= 6,63 \times 10^{-34} f$ ✓ ✓ Both formulae *Beide formules* $\therefore f = 1,04 \times 10^{15}$ Hz $c = f\lambda$ $3 \times 10^{8} = 1,04 \times 10^{15}\lambda$ ✓ $\therefore \lambda = 2,88 \times 10^{-7}$ m ✓	Accept/*Aanvaar:* $v = f\lambda$

(5)

11.2.2 $E = W_o + E_k$ ✓

$6,9 \times 10^{-19} = 6,4 \times 10^{-19} + E_k$ ✓

$\therefore E_k = 5 \times 10^{-20}$ J ✓   (3)

11.3
11.3.1   Increases/*Vermeerder* ✓
- More photons (packets of energy) strike the surface of the metal per unit time./*Meer fotone (pakkies energie) tref die oppervlakte van die metaal per eenheid tyd.* ✓
- More (photo)electrons ejected per unit time./*Meer (foto)elektrone vrygestel per eenheid tyd.* ✓   (3)

11.3.2   Increases/*Vermeerder* ✓
- (Photo)electrons are emitted with higher kinetic energy/move faster./ *(Foto)elektrone word vrygestel met hoër kinetiese energie/beweeg vinniger.* ✓
- Increase in rate of flow of charge./Same number of charges pass a point in a shorter time./*Toename in tempo van vloei van lading/dieselfde aantal lading beweeg verby 'n punt in 'n korter tyd.* ✓   (3)

[16]

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