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)

NOVEMBER 2011

MEMORANDUM

MARKS/*PUNTE*: 150

This memorandum consists of 13 pages.
Hierdie memorandum bestaan uit 13 bladsye.

SECTION A

QUESTION 1 / *VRAAG 1*

1.1   Power ✓
        Drywing / Arbeidstempo ✓   (1)

1.2   Coherent / *Koherent* ✓   (1)

1.3   Dielectric / *Diëlektrikum* ✓   (1)

1.4   Alternating (current) / AC / ac ✓
        Wissel(stroom) / WS / ws ✓   (1)

1.5 $N \cdot C^{-1}$ / $V \cdot m^{-1}$ / newton per coulomb / volt per meter ✓   (1)
                                                                          [5]

QUESTION 2 / *VRAAG 2*

2.1   C ✓✓   (2)

2.2   D ✓✓   (2)

2.3   D ✓✓   (2)

2.4   C ✓✓   (2)

2.5   B ✓✓   (2)

2.6   A ✓✓   (2)

2.7   C ✓✓   (2)

2.8   C ✓✓   (2)

2.9   D ✓✓   (2)

2.10   B ✓✓   (2)
                                                                          [20]

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

SECTION B / *AFDELING B*

QUESTION 3 / *VRAAG 3*

3.1   The initial <u>velocity / speed of the camera is the same</u> ✓
(as that of the balloon).
*Die begin<u>snelheid / spoed van die kamera</u> is <u>dieselfde</u> ✓ (as dié van die
ballon).*   (1)

3.2   **Downward positive:**
Afwaarts positief:
$\Delta y = v_i \Delta t + \frac{1}{2} a \Delta t^2$ ✓
$\therefore 92,4$ ✓ $= \underline{v_i(6) + \frac{1}{2}(9,8)(6)^2}$ ✓
$\therefore v_i = -14 \text{ m·s}^{-1}$
$\therefore v_i = 14 \text{ m·s}^{-1}$ ✓

Downward negative:
Afwaarts negatief:
$\Delta y = v_i \Delta t + \frac{1}{2} a \Delta t^2$ ✓
$\therefore -92,4$ ✓ $= \underline{v_i(6) + \frac{1}{2}(-9,8)(6)^2}$ ✓
$\therefore v_i = 14 \text{ m·s}^{-1}$ ✓   (4)

3.3   Upward positive/*Opwaarts positief*:
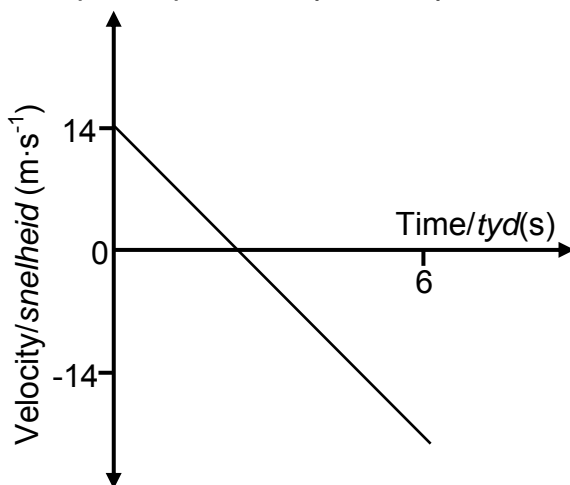
Criteria for graph/*Kriteria vir grafiek:*	Marks/*Punte*
Correct shape as shown.(straight line with gradient) Korrekte *vorm soos getoon.(reguitlyn met gradient)*	✓
Graph starts at v = 14 m·s⁻¹ / vᵢ at t = 0 s. *Grafiek begin by v = 14 m·s⁻¹ / vᵢ by t = 0 s.*	✓
Graph extends below t axis until t = 6 s. *Grafiek verleng onder t-as tot t = 6 s.*	✓
Section of graph below t axis longer than section above t axis. *Gedeelte van grafiek onderkant t-as langer as gedeelte bokant t-as.*	✓

Upward negative / *Opwaarts negatief:*
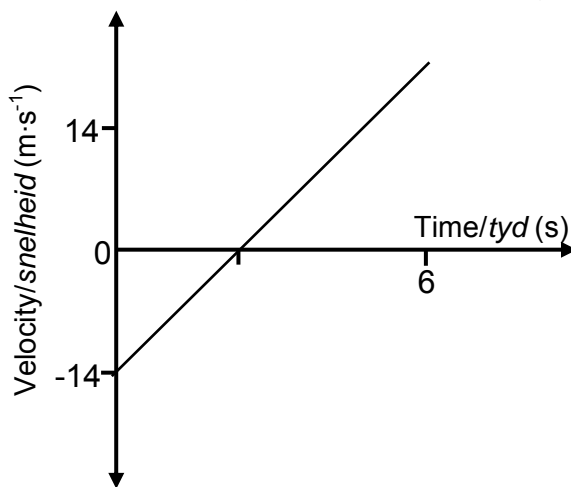
Criteria for graph/*Kriteria vir grafiek:*	Marks/*Punte*
Correct shape as shown. *Korrekte vorm soos getoon.*	✓
Graph starts at v / v_i = -14 m·s^{-1} at t = 0 s. *Grafiek begin by v/v_i = -14 m·s^{-1} by t = 0 s.*	✓
Graph extends above t axis until t = 6 s. *Grafiek verleng bokant t-as tot t = 6 s.*	✓
Section of graph above t axis longer than section below t axis. *Gedeelte van grafiek bokant t-as langer as gedeelte onderkant t-as.*	✓

(4)

3.4

Option 1 / *Opsie 1*:
$\Delta x = v\Delta t$ ✓
∴ 10 ✓ = (2)Δt ✓
∴ Δt = 5 s ✓
Yes/ <u>Will catch the camera</u>, time is less than
6 s. ✓
Ja / <u>Sal die kamera vang</u>, tyd is kleiner as 6 s. ✓

Option 2/*Opsie 2*:
$\Delta x = v\Delta t$ ✓
    = (2) ✓ (6) ✓
    = 12 m ✓
Yes / <u>Will catch the camera</u>, distance covered is greater than 10 m. ✓
Ja / <u>Sal die kamera vang</u> , afstand afgelê is groter as 10 m. ✓

Option 3 / *Opsie 3*:
$\Delta x = v_i\Delta t + \frac{1}{2}a\Delta t^2$ ✓
∴ 10 ✓ = (2)Δt ✓ + ½(0)Δt
∴ Δt = 5 s ✓
Yes/ <u>will catch the camera</u>, time is less than 6 s ✓.
Ja / <u>Sal die kamera vang</u>, tyd is kleiner as 6 s. ✓

Option 4 / *Opsie 4*:
$\Delta x = (\dfrac{v_i + v_f}{2})\Delta t$ ✓ ∴ 10 ✓ = $(\dfrac{2+2}{2})\Delta t$ ✓ ∴ Δt = 5 s ✓
Yes / <u>Will catch the camera</u>, time is less than 6 s. ✓
Ja / <u>Sal die kamera vang</u>, tyd is kleiner as 6 s. ✓

Option 5 / *Opsie 5*:
$\Delta x = (\dfrac{v_i + v_f}{2})\Delta t$ ✓   = $(\dfrac{2+2}{2})$ ✓ 6 ✓ = 12 m· ✓
Yes / <u>Will catch the camera</u>, distance covered is greater than 10 m. ✓
Ja / <u>Sal die kamera vang</u> , afstand afgelê is groter as 10 m. ✓

(5)
[14]

QUESTION 4 / *VRAAG 4*

4.1   30 m·s^{-1} ✓ east / *oos* ✓

Notes / *Aantekeninge*:
$v_{TP} = v_{TG} - v_{PG} = 40 - 10 = 30$
$\therefore v_{TP} = 30$ m·s^{-1} east/*oos*
OR/*OF*
$v_{TP} = v_{TG} + v_{GP} = 40 + (-10) = 30$
$\therefore v_{TP} = 30$ m·s^{-1} east/*oos*

(2)

4.2   70 m·s^{-1} ✓ east / *oos* ✓

Notes / *Aantekeninge*:	
Solution 1 / *Oplossing 1*:	**Solution 3 / *Oplossing 3***
$v_{BT} = v_{BP} - v_{TP}$	$v_{BT} = v_{BP} + v_{PG} + v_{GT}$
$\quad = 100 - 30 = 70$	$\quad = 100 + 10 + (-40)$
$\therefore v_{BT} = 70$ m·s^{-1} east / *oos*	$\quad = 70$
	$\therefore v_{BT} = 70$ m·s^{-1} east / *oos*
Solution 2 / *Oplossing 2*	
$v_{BT} = v_{BP} + v_{PT}$	**Solution 4 / *Oplossing 4***
$\quad = 100 + (-30) = 70$	$v_{BG} = v_{BP} + v_{PG}$
$\therefore v_{BT} = 70$ m·s^{-1} east/*oos*	$\quad = 100 + 10 = 110$
	$\therefore v_{BG} = 110$ m·s^{-1}
OR / OF	$v_{BT} = v_{BG} + v_{GT}$
$v_{BT} = v_{BP} + v_{PG} + v_{GT}$	$\quad = 110 + (-40) = 70$
$\quad = 100 + 10 + (-40)$	$\therefore v_{BT} = 70$ m·s^{-1} east / *oos*
$\quad = 70$	
$\therefore v_{BT} = 70$ m·s^{-1} east / *oos*	

(2)

4.3   The <u>total (linear) momentum remains constant</u>/is conserved / does not change. ✓
        in <u>an isolated</u>/a closed system/the absence of external forces. ✓

Die <u>totale (liniêre) momentum bly konstant /</u> behoue / verander nie ✓
in '<u>n geïsoleerde sisteem /</u> geslote sisteem / die afwesigheid van eksterne kragte. ✓

(2)

4.4

> **Option 1 / *Opsie 1*:**
> To the right as positive / *Na regs as positief:*
> $$\Sigma \, p_{before/ \, voor} = \Sigma \, p_{after/ \, na} \checkmark$$
> $\underline{(1\,000)(40)} \checkmark + \underline{(5\,000)(-20)} \checkmark = \underline{(1\,000 + 5\,000)v_f} \checkmark$
> $\therefore v_f = -10 \text{ m·s}^{-1} \checkmark$
> $\therefore v_f = 10 \text{ m·s}^{-1} \underline{\text{left} / \textit{na links}} \checkmark$ **OR / *OF*** west / *wes*

> **Option 2 / *Opsie 2*:**
> To the right as positive / *Na regs as positief:*
> $\Delta p_{car} = -\Delta p_{truck} \checkmark$
> $m(v_f - v_i) = -m(v_f - v_i)$
> $\underline{(1000)(v_f - (40))} \checkmark = \underline{-(5\,000)(v_f} \checkmark - (-20)) \checkmark$
> $6\,000v_f = -60\,000$
> $\therefore v_f = -10 \text{ m·s}^{-1} \checkmark$
> $\therefore v_f = 10 \text{ m·s}^{-1} \underline{\text{left} / \textit{na links}} \checkmark$ **OR/*OF*** west / *wes*

(6)

4.5

Option 1 / *Opsie 1*:	
Force on car / *Krag op motor:* To the right as positive / *Na regs as positief:* $F_{net}\Delta t = \Delta p \checkmark = mv_f - mv_i$ $F_{net}(0,5) \checkmark = \underline{1\,000(-10 - 40)} \checkmark$ $\therefore F_{net} = -1 \times 10^5 \text{ N} \checkmark$ OR/*OF* $\therefore F_{net} = 1 \times 10^5 \text{ N } (100\,000 \text{ N})$ $\therefore F_{net} > 85\,000 \text{ N}$ Yes, collision is fatal. / *Ja botsing is fataal.* $\checkmark$	Force on car / *Krag op motor:* To the left as positive / *Na links as positief:* $F_{net}\Delta t = \Delta p \checkmark = mv_f - mv_i$ $F_{net}(0,5) \checkmark = \underline{1\,000(10 - (- 40))} \checkmark$ $\therefore F_{net} = 1 \times 10^5 \text{ N} \checkmark (100\,000 \text{ N})$ $\therefore F_{net} > 85\,000 \text{ N}$ Yes, collision is fatal. / *Ja, botsing is fatal.* $\checkmark$
Option 2 / *Opsie 2*: Force on truck / *Krag op vragmotor:* To the right as positive / *Na regs as positief:* $F_{net}\Delta t = \Delta p \checkmark = mv_f - mv_i$ $F_{net}(0,5) \checkmark = \underline{5\,000(-10 - (-20))} \checkmark$ $\therefore F_{net} = 1 \times 10^5 \text{ N} \checkmark (100\,000 \text{ N})$ $\therefore F_{net} > 85\,000 \text{ N}$ Yes, collision is fatal. / *Ja, botsing is fataal.* $\checkmark$	Force on truck / *Krag op vragmotor:* To the left as positive / *Na links as positief:* $F_{net}\Delta t = \Delta p \checkmark = mv_f - mv_i$ $F_{net}(0,5) \checkmark = \underline{5\,000(10 - 20)} \checkmark$ $\therefore F_{net} = -1 \times 10^5 \text{ N} \checkmark$ $\therefore F_{net} = 1 \times 10^5 \text{ N } (100\,000 \text{ N})$ $\therefore F_{net} > 85\,000 \text{ N}$ Yes, collision is fatal / *Ja, botsing is fataal.* $\checkmark$
Option 3 / *Opsie 3:* Force on car / *Krag op motor:* To the right as positive / *Na regs as positief:* $v_f = v_i + a\,\Delta t$ $\therefore \underline{-10 = 40 + a(0,5)} \checkmark$ $\therefore a = -100$ $F_{net} = ma = (1\,000)(-100) \checkmark$ $\therefore F_{net} = -1 \times 10^5 \text{ N} \checkmark (-100\,000 \text{ N})$ $\therefore F_{net} = 1 \times 10^5 \text{ N } (100\,000 \text{ N})$ $\therefore F_{net} > 85\,000 \text{ N}$ Yes, collision is fatal. / *Ja, botsing is fataal.* $\checkmark$ ☐ $\checkmark$ Both formulae/ *Beide formules*	Force on car / *Krag op motor:* To the left as positive / *Na links as positief:* $v_f = v_i + a\,\Delta t$ $\therefore \underline{10 = - 40 + a(0,5)} \checkmark$ $\therefore a = 100$ $F_{net} = ma = (1\,000)(100) \checkmark$ $\therefore F_{net} = 1 \times 10^5 \text{ N} \checkmark (100\,000 \text{ N})$ $\therefore F_{net} > 85\,000 \text{ N}$ Yes, collision is fatal. / *Ja, botsing is fataal.* $\checkmark$ ☐ $\checkmark$ Both formulae/ *Beide formules*

<table>
<tr><td>

Option 4 / *Opsie 4*:
Force on truck / *Krag op vragmotor:*
To the right as positive / *Na regs as positief:*

$v_f = v_i + a \Delta t$

∴ $-10 = -20 + a(0,5)$ ✓

∴ a = 20

F_{net} = ma = (5 000)(20) ✓

∴ $F_{net} = 1 \times 10^5$ N ✓ (100 000 N)

∴ $F_{net} > 85\ 000$ N

Yes, collision is fatal. / *Ja, botsing is fataal.* ✓

</td><td>

Force on truck / *Krag op vragmotor:*
To the left as positive / *Na links as positief:*

$v_f = v_i + a \Delta t$

∴ $10 = 20 + a(0,5)$ ✓

∴ a = -20

F_{net} = ma = (5 000)(-20) ✓

∴ $F_{net} = -1 \times 10^5$ N ✓ (-100 000 N)

∴ $F_{net} = 1 \times 10^5$ N (100 000 N)

∴ $F_{net} > 85\ 000$ N

Yes, collision is fatal. / *Ja, botsing is fataal.* ✓

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

✓ Both formulae/ *Beide formules*

(5)

[17]

QUESTION 5 / *VRAAG 5*

5.1   The <u>net (total) work</u> (done on an object) ✓
        is <u>equal to</u> the <u>change in kinetic energy</u> (of the object.) ✓
        Die <u>netto (totale) arbeid (verrig op 'n voorwerp)</u> ✓
        is <u>gelyk aan</u> die <u>verandering in kinetiese energie</u> (van die voorwerp) ✓

   OR / *OF*
   The <u>work done</u> (on an object) <u>by a net (resultant) force</u> ✓
   is <u>equal to</u> the <u>change in</u> (the object's) <u>kinetic energy.</u> ✓
   Die <u>arbeid verrig</u> (op 'n voorwerp) deur 'n <u>netto (resulterende) krag</u> ✓
   is <u>gelyk aan</u> die <u>verandering in kinetiese energie</u> (van die voorwerp.) ✓   (2)

5.2

$F_{applied}$/*applied* ✓

f ✓

w ✓
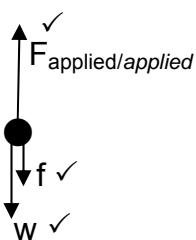
(3)

5.3   Gravitational force/weight (of soldier) ✓
        Gravitasiekrag/gewig (van soldaat)   (1)

5.4 $W_{net} = \Delta K$ ✓

        $F\Delta y\cos\theta + F_w\Delta y\cos\theta + W_f = \Delta K$

        $\underline{(960)(20)\cos0°}$ ✓ $+ \underline{(80)(9,8)(20)\cos180°}$ ✓ $+ W_f = \underline{0}$ ✓

        $19\ 200 - 15\ 680 + W_f = 0$

        $W_f = -3\ 520$ J ✓   (5)

[11]

QUESTION 6 / *VRAAG 6*

6.1   Doppler effect / *Doppler-effek* ✓   (1)

6.2
$$f_L = \frac{v \pm v_L}{v \pm v_s} f_s ✓$$

$$\therefore f_L = \frac{340 \pm 0}{340 - 20} ✓ \ (458) ✓$$

$\therefore f_L = 486{,}63 \ Hz ✓$ (4)

6.3   Decreases/*Verlaag* ✓   (1)

6.4   Equal to/*Gelyk aan* ✓

Velocity of train driver relative to the whistle is zero. ✓
Snelheid van treindrywer relatief tot fluitjie is nul.

OR / *OF*
Train driver has same velocity as whistle.
Treindrywer het dieselfde snelheid as die fluitjie.

OR / *OF*
There is no relative motion between source and observer.
Daar is geen relatiewe beweging tussen bron en waarnemer.   (2)

[8]

QUESTION 7 / *VRAAG 7*

7.1   Light of a <u>single wavelength</u> **OR** single frequency. ✓✓
         Lig van 'n <u>enkele golflengte</u> OF enkele frekwensie. ✓✓   (2)

7.2

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 <u>dependent</u> and <u>independent</u> <u>variables.</u> *Vra 'n vraag oor die verwantskap tussen die <u>afhanklike</u> en <u>onafhanklike</u> veranderlikes.*	✓

Examples/*Voorbeelde:*
- How will the <u>broadness / width of the central band</u> change / differ when <u>slit</u>
  <u>width changes /</u> is increased / is decreased?
  Hoe sal die <u>breedte / wydte van die sentrale helderband</u> verander / verskil
  wanneer die <u>spleetwydte verander /</u> toeneem / afneem?

- What is the relationship between the broadness of the central bright band
  and slit width?
  Wat is die verwantskap tussen die breedte van die sentrale helderband en
  spleetwydte?   (2)

7.3   Wavelength (of light) / Frequency (of light) / Colour of light/ Light source ✓
        <u>Distance between slit and screen.</u> ✓

        Golflengte (van lig) / Frekwensie (van lig) / Kleur van lig / Ligbron ✓
        <u>*Afstand tussen spleet en skerm.*</u> ✓   (2)

7.4   Increases / *Vermeerder* ✓
        Diffraction is inversely proportional to slit width. ✓
        Diffraksie is omgekeerd eweredig aan spleetwydte. ✓

        OR/*OF*
        Increases / *Vermeerder* ✓

        Diffraction / *Diffraksie* OR/*OF* $\sin\theta \; \alpha \; \dfrac{1}{a}$ ✓   (2)

7.5   **Option 1 / *Opsie 1:***

        $\sin\theta = \dfrac{m\lambda}{a}$ ✓✓

        $\sin\theta = \dfrac{(2)(4\times10^{-7})}{2,2\times10^{-6}}$ ✓✓

        $\therefore \; \theta = 21,32°$ ✓

        Option 2 / *Opsie 2:*

        $\sin\theta = \dfrac{m\lambda}{a}$ ✓✓

        $\sin\theta = \dfrac{(-2)(4\times10^{-7})}{2,2\times10^{-6}}$ ✓✓

        $\therefore \; \theta = -21,32°$ ✓   (5)
                                                                                        [13]

QUESTION 8 / *VRAAG 8*

8.1   T to/*na* P ✓   (1)

8.2 $Q = \dfrac{3\times10^{-9}+(-6\times10^{-9})}{2}$ ✓ $= -1,5 \times 10^{-9}$ C

        $\Delta Q_P = Q_P(\text{final}) - Q_P(\text{initial})$
        $\qquad = -1,5 \times 10^{-9} - 3 \times 10^{-9}$ ✓
        $\qquad = -4,5 \times 10^{-9}$ C ✓

        OR / *OF*
        $\Delta Q_T = Q_T(\text{final}) - Q_T(\text{initial})$
        $\qquad = -1,5 \times 10^{-9} - (-6 \times 10^{-9})$ ✓
        $\qquad = 4,5 \times 10^{-9}$ C ✓   (3)

8.3   Number of electrons / *Getal elektrone* $= \dfrac{-4,5\times10^{-9}}{-1,6\times10^{-19}}$ ✓
                                                    $= 2,81 \times 10^{10}$ ✓   (2)

8.4

Option 1 / *Opsie 1*

$F_{TR} = \dfrac{kQ_1Q_2}{r^2}$ ✓
 	
 $= \dfrac{(9 \times 10^9)(1{,}5 \times 10^{-9})(3 \times 10^{-9})}{1^2}$ ✓
 	
 $= 4{,}05 \times 10^{-8}$ N to the left/towards P
            na links/na P toe
 	
 $F_{PR} = \dfrac{kQ_1Q_2}{r^2}$
 	
 $= \dfrac{(9 \times 10^9)(1{,}5 \times 10^{-9})(3 \times 10^{-9})}{0{,}5^2}$ ✓
 	
 $= 1{,}62 \times 10^{-7}$ N to the right/towards T
            na regs/na T toe
 	
 ✓Any one *Enige een*
 	
 To the right / towards T as positive: / *Na regs / na T toe as positief*
 $F_{net} = 1{,}62 \times 10^{-7} - 4{,}05 \times 10^{-8}$
      $= 1{,}22 \times 10^{-7}$ N $(1{,}215 \times 10^{-7}$ N$)$
      $= 1{,}22 \times 10^{-7}$ N ✓ to the right / towards T / *na regs / na T toe* ✓

(6)

[12]

QUESTION 9 / *VRAAG 9*

9.1 Current / I / *stroom* ✓   (1)

9.2

9.2.1 $(4{,}0$ ✓ $; 0{,}64)$ ✓   (2)

9.2.2 Temperature was not kept constant. ✓✓
         Temperatuur is nie konstant gehou nie. ✓✓   (2)

9.3 Gradient/m $= \dfrac{\Delta y}{\Delta x} = \dfrac{0{,}64 - 0}{4 - 0}$ ✓✓ $= 0{,}16$

      $R = \dfrac{1}{0{,}16} = 6{,}25 \ \Omega$ ✓✓

(4)

[9]

QUESTION 10 / *VRAAG 10*

10.1 12 V ✓   (1)

10.2.1

Option 1 / *Opsie 1:*	Option 2 / *Opsie 2:*
$I = \dfrac{V}{R}$ ✓ $= \dfrac{9{,}6}{2{,}4}$ ✓ $= 4$ A	emf $= IR + Ir$ ✓ $12 = I(2{,}4) + 2{,}4$ ✓ $\therefore I = 4$ A ✓

(3)

10.2.2

Option 1 / *Opsie 1:*	Option 2 / *Opsie 2*:
emf/*emk* = IR + Ir ✓ 12 = 9,6 + 4r ✓ ∴ r = 0,6 Ω ✓	$V_{lost/verlore}$ = Ir ✓ 2,4 = 4r ✓ ∴ r = 0,6 Ω ✓
Option 3 / *Opsie 3*: emf/*emk* = I(R + r) ✓ 12 = 4(2,4 + r) ✓ ∴ r = 0,6 Ω ✓	

(3)

10.3

Option 1 / *Opsie 1*:	Option 2 / *Opsie 2*:
emf/*emk* = I(R + r) ✓ 12 = 6(R + 0,6) ✓ $R_{ext/eks}$ = 1,4 Ω $\dfrac{1}{R} = \dfrac{1}{R_1} + \dfrac{1}{R_2}$ ✓ $\dfrac{1}{1,4} = \dfrac{1}{2,4} + \dfrac{1}{R}$ ✓ ∴ R = 3,36 Ω Each tail lamp/*Elke agterlig:* : R = 1,68 Ω ✓	Emf = $V_{terminal}$ + Ir ✓ 12 = $V_{terminal}$ + 6(0,6) ✓ ∴ $V_{terminal}$ = 8,4 V $I_{2,4\,Ω} = \dfrac{V}{R} = \dfrac{8,4}{2,4} = 3,5$ A $I_{tail\,lamps/agterligte}$ = 6 – 3,5 = 2,5 A $R_{tail\,lamps/agterligte} = \dfrac{V}{I}$ ✓ $= \dfrac{8,4}{2,5}$ ✓ = 3,36 Ω $R_{tail\,lamp/agterlig}$ = 1,68 Ω ✓
Option 3 / *Opsie 3:*	**Option 4 / *Opsie 4:***
V = IR ✓ 12 = (6)R ✓ R_{ext} = 2 Ω ∴$R_{parallel}$ = 2 – 0,6 = 1,4 Ω $\dfrac{1}{R} = \dfrac{1}{R_1} + \dfrac{1}{R_2}$ ✓ $\dfrac{1}{1,4} = \dfrac{1}{2,4} + \dfrac{1}{R}$ ✓ ∴ R = 3,36 Ω Each tail lamp/*Elke agterlig*: R = 1,68 Ω ✓	For parallel combination: $I_1 + I_2$ = 6 A *Vir parallelle kombinasie: $I_1 + I_2$ = 6 A* ∴ $\dfrac{V}{2,4} + \dfrac{V}{R_{taillamps}}$ ✓ = 6 ✓ 8,4 ✓ $\left(\dfrac{1}{2,4} + \dfrac{1}{R_{taillamps}}\right)$ ✓ = 6 ∴ $R_{tail\,lamps/agterligte}$ = 3,36 $R_{tail\,lamp/agterligte}$ = 1,68 Ω ✓

(5)

10.4   Increases / *Vermeerder* ✓
Resistance increases, current decreases ✓
Ir (lost volts) decreases ✓

Vermeerder ✓
Weerstand verhoog, stroom verlaag ✓
Ir (verlore volts) verminder / neem af. ✓

(3)

[15]

QUESTION 11 / *VRAAG 11*

11.1.1 Electrical (energy) to mechanical / kinetic (energy) ✓
Elektriese (energie) na meganiese / kinetiese (energie) ✓ (1)

11.1.2 Mechanical / kinetic (energy) to electrical (energy) ✓
Meganiese / kinetiese (energie) na elektriese (energie) ✓ (1)

11.1.3 Motor effect / *Motor-effek* ✓ (1)

11.1.4 Electromagnetic induction ✓
Elektromagnetiese induksie ✓ (1)

11.2 BC / conductor is <u>parallel</u> ✓ to the <u>magnetic field.</u> ✓
BC / geleier is <u>parallel</u> ✓ aan die <u>magneetveld.</u> ✓

OR / *OF*
Open switch ✓, no current. ✓
Oop skakelaar ✓, *geen stroom.* ✓ (2)

11.3

Option 1 / *Opsie 1*:	**Option 2 / *Opsie 2*:**
$P_{ave} = V_{rms}I_{rms}$ ✓ $= \dfrac{V_{max}}{\sqrt{2}}$ ✓ $\cdot \dfrac{I_{max}}{\sqrt{2}}$ ✓ $= \dfrac{(311)(21)}{2}$ ✓✓ $= 3\ 265,5$ W ✓ **OR / OF** $P_{max} = V_{max}I_{max}$ ✓ $= (311)$ ✓ (21) ✓ $= 6531$ W $\therefore P_{ave} = \dfrac{P_{max}}{2}$ ✓✓ $= \dfrac{6531}{2}$ $= 3\ 265,5$ W ✓	$V_{rms} = \dfrac{V_{max}}{\sqrt{2}}$ ✓ $= \dfrac{311}{\sqrt{2}}$ ✓ $= 219,91$ V $I_{rms} = \dfrac{I_{max}}{\sqrt{2}}$ ✓ $= \dfrac{21}{\sqrt{2}}$ ✓ $= 14,85$ A $P_{ave} = V_{rms}I_{rms}$ ✓ $= (219,91)(14,85)$ $= 3\ 265,66$ W ✓
Option 3 / *Opsie 3*	**Option 4 / *Opsie 4***
$R = \dfrac{V}{I}$ ✓ $= \dfrac{311}{21}$ ✓ $= 14,81\ \Omega$ $I_{rms} = \dfrac{I_{max}}{\sqrt{2}}$ ✓ $= \dfrac{21}{\sqrt{2}}$ ✓ $= 14,85$ A $P_{ave} = I^2_{rms}R$ ✓ $= (14,85)^2(14,81)$ $= 3\ 265,83$ W ✓	$R = \dfrac{V}{I}$ ✓ $= \dfrac{311}{21}$ ✓ $= 14,81\ \Omega$ $V_{rms} = \dfrac{V_{max}}{\sqrt{2}}$ ✓ $= \dfrac{311}{\sqrt{2}}$ ✓ $= 219,91$ V $P_{ave} = \dfrac{V^2_{rms}}{R}$ ✓ $= \dfrac{219,41^2}{14,81}$ $= 3\ 265,83$ W ✓

(6)

[12]

QUESTION 12 / *VRAAG 12*

12.1   Photo-electric effect / *Foto-elektriese effek* ✓   (1)

12.2   Work function / *Werkfunksie / Arbeidsfunksie* ✓   (1)

12.3 $c = f\lambda$ ✓
3×10^8 ✓ $= f(330 \times 10^{-9})$ ✓
$\therefore f = 9{,}09 \times 10^{14}$ Hz ✓

OR/*OF*

$E = \dfrac{hc}{\lambda} = \dfrac{(6{,}63 \times 10^{-34})(3 \times 10^8)}{330 \times 10^{-9}}$ ✓ $= 6{,}03 \times 10^{-19}$ J

$E = hf$
$6{,}03 \times 10^{-19} = (6{,}63 \times 10^{-34})f$ ✓
$\therefore f = 9{,}09 \times 10^{14}$ Hz ✓   (4)

✓ for both equations
vir beide vergelykings

12.4

Option 1 / *Opsie 1*:

$E = W_o + K$
$\dfrac{hc}{\lambda} = W_o + K$ ✓ Any one / *Enige een*

$\therefore \dfrac{(6{,}63 \times 10^{-34})(3 \times 10^8)}{330 \times 10^{-9}}$ ✓ $= 3{,}5 \times 10^{-19} + K$ ✓
$\therefore K = 2{,}53 \times 10^{-19}$ J ✓

Option 2 / *Opsie 2*:

$E = W_o + K$
$hf = W_o + K$ ✓ Any one / *Enige een*
$\therefore (6{,}63 \times 10^{-34})(9{,}09 \times 10^{14})$ ✓ $= 3{,}5 \times 10^{-19} + K$ ✓
$\therefore K = 2{,}53 \times 10^{-19}$ J ✓

(4)

12.5
12.5.1   Remains the same / *Bly dieselfde* ✓   (1)

12.5.2   Increases / *Vermeerder* ✓   (1)

12.6
12.6.1   Ultraviolet radiation / *Ultraviolet-straling* ✓   (1)

12.6.2   High energy / high frequency ✓
Hoë energie / hoë frekwensie   (1)

[14]

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