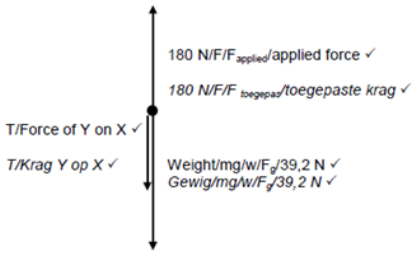
MEMORANDUM

PHYSICAL SCIENCE/FISIESE WETENSKAPPE **SEPTEMBER 2018**

CW PLC COMMON PAPER 1

QUESTION 1			
1.1	A		(2)
1.2	A		(2)
1.3	C		(2)
1.4	D		(2)
1.5	D		(2)
1.6	A		(2)
1.7	B		(2)
1.8	B		(2)
1.9	D		(2)
1.10	D		(2) **[20]**

QUESTION 2

21.	2.1.1	When a resultant/net force acts on an object, the object accelerates in the direction of the (net) force at an acceleration directly proportional to the force √ and inversely proportional to the mass of the object. √ *Wanneer 'n resultante /netto krag op 'n voorwerp uitgeoefen word, versnel die voorwerp in die rigting van die (netto) krag met 'n versnelling direk eweredig aan die grootte van die krag √ en omgekeerd eweredig aan die massa van die voorwerp.* √	(2)
	2.1.2	 **Notes/*Aantekeninge:*** • Correct arrow and label for each force for one mark. / *Korrekte pyle en benoeming vir elke krag vir een punt.* • Comparative lengths of arrows are not required. / *Vergelykende lengte van pyle nie vereiste nie.*	(3)
	2.1.3	(a) For block **X** / *Vir blok **X***: F_{net} = ma ✓ 180 - w – T = ma 180 - (4)(9,8) – T = 4a ✓ 140,8 – T = 4a .....(i) For block **Y**/ *Vir blok **Y***: F_{net} = ma T - w = ma T - (8)(9,8) = 8a ✓ -78,4 +T = 8a.....(ii) 281,6 – 2T = 8a -78,4 + T = 8a ✓ 360 – 3T = 0 T = 120 N T = 120 N upwards / *opwaarts* ✓ **Note/*Aantekeninge:*** • If the system approach is used to first calculate acceleration and then acceleration is substituted to obtain T: Max. **3/5** • *Indien die stelsel benader word om eerstens versnelling te bereken en dan die versnelling gebruik om T te bereken:* *Maks* **3/5** Option 2 for resolving two equations: 140,8 - T = 4a.....(i) -78,4 + T = 8a .....(ii) 62,4 = 12 a a = 5,2 ms^{-2} T = 8 a + 78,4 = 120 N	(5)

Commented [1]: If a candidate add the masses (12 kg) directly into Fnet = ma, 2 marks maximum!

-1 mark for formula
- 1 mark for correct calculation of combined weight (117,6 N)

Commented [2]: Accepted

Commented [3]: Candidate receives full marks for (b) if Option 2 is used in (a). Candidate must show the answer in (b)

Commented [4]: Yes...answer MUST be shown in (b).

	2.1.3	(b) **POSITIVE MARKING FROM *QUESTION 2.3.1* / *POSITIEWE NASIEN VAN VRAAG 2.3.1*** **OPTION / *OPSIE* 1** -78,4 +T = 8a -78,4 + 120 = 8a ✓ a = 5,2 m·s^{-2} ✓ **OPTION / *OPSIE* 2** 140,8 – T = 4a 140,8 – 120 = 4a ✓ a = 5,2 m·s^{-2} ✓ **OPTION / *OPSIE* 3** 281,6 -2T = 8a 281,6 + 220 = 8a ✓ a = 5,2 m·s^{-2} ✓	(2)
2.2			
	2.2.1	2 x 10^3 N. ✓	(1)
	2.2.2	Option 1: F = Gm$_1$m$_2$ / r^2 ✓ (2 x 10^3) ✓ = $\frac{(6,67\text{x}10^{-11})(5,98\ \text{x}10^{24})(400)}{r^2}$ ✓ r = 8,93 x 10^6 m ✓ Distance above Earth's surface/ Afstand bo Aardoppervlak = = (8,93 x 10^6) – (6,38 x 10^6) = 2,55 x 10^6 m = 2,55 x 10^3 km ✓ Option 2: $F = \frac{Gm_1m_1}{r^2}$ ✓ 2 x 10^3 ✓ = $\frac{(6,67 \text{ x } 10^{-11})(5,98 \text{ x } 10^{24})(400)}{(h+(6,38 \text{ x } 10^6))^2}$ ✓ ✓ (h + 6,38 x 10^6)^2 = 7,99732 x 10^{13} h + 6,38 x 10^6 = 8,93 x 10^6 h = 2,55 x 10^6 m = 2,55 x 10^3 km ✓	(5)
			[18]

QUESTION 3	

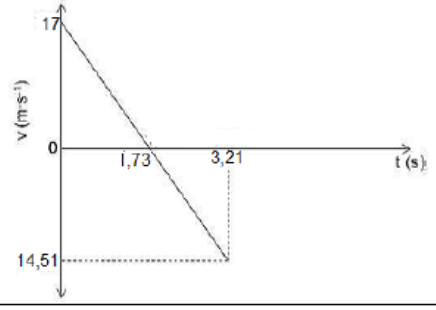
Commented [5]: I added Option 2

Commented [6]: Thanks

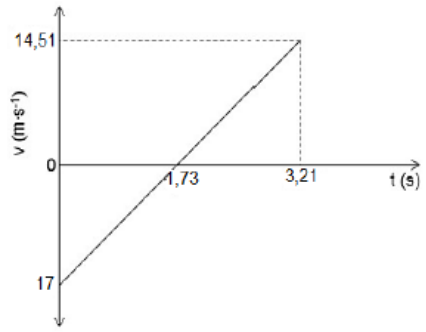
Commented [7]: I suggest that the candidate receives full marks for a final answer in meter.

Commented [8]: Accepted

<table>
<tr><td>3.1</td><td colspan="2">g = 9,8 m.s^{-1} ✓ downwards/afwaarts ✓</td><td>(2)</td></tr>
<tr><td>3.2</td><td>3.2.1</td><td>
<table>
<tr><td>OPTION/OPSIE 1
(downward positive/afwaarts positief)
$v_f = v_i + g\Delta t$ ✓
$0 = \underline{(-17) + 9,8\Delta t}$ ✓
$\Delta t = 1,73$ s ✓</td><td>OPTION/OPSIE 2
(upwards positive/opwaarts positief)
$v_f = v_i + 2g\Delta t$ ✓
$0 = \underline{(17)^2 + (-9,8)\Delta t}$ ✓
$\Delta t = 1,73$ s ✓</td></tr>
</table>
</td><td>(3)</td></tr>
<tr><td></td><td>3.2.2</td><td>
<table>
<tr><td>OPTION/OPSIE 1
Downwards is positive Afwaarts positief
$v_f^2 = v_i^2 + 2a\Delta y$ ✓
$v_f^2 = (-17)^2 + 2 \times (9,8)(-4)$ ✓
$v_f^2 = 210,6$
$v_f = 14,51$ m·s^{-1} downward /afwaarts ✓</td><td>OPTION/OPSIE 2
Upwards is positive Opwaarts positief
$v_f^2 = v_i^2 + 2a\Delta y$ ✓
$v_f^2 = (17)^2 + 2 \times (-9,8)(4)$ ✓
$v_f^2 = 210,6$
$v_f = 14,51$ m·s^{-1} downward /afwaarts✓</td></tr>
</table>
</td><td>(3)</td></tr>
<tr><td></td><td>3.2.3</td><td>
Downwards is positive (Afwaarts is positief)
<table>
<tr><td>OPTION/OPSIE 1
$\Delta y = v_i \Delta t + \frac{1}{2} a\Delta t^2$ ✓
$\underline{-4}$ ✓ $= \underline{-17\ \Delta t + \frac{1}{2}(9,8)(\Delta t)^2}$ ✓
$-4 = -17\Delta t + 4,9\ (\Delta t)^2$
$\Delta t = 3,21$s or/of $\Delta t = 0,25$s
$\Delta t = 3,21$s ✓</td><td>Upwards is positive (Opwaarts is positief)
OPTION/OPSIE 2
$\Delta y = v_i \Delta t + \frac{1}{2} a\Delta t^2$ ✓
$\underline{4}$ ✓ $= \underline{17\ \Delta t + \frac{1}{2}(-9,8)(\Delta t)^2}$ ✓
$4 = 17\Delta t - 4,9\ (\Delta t)^2$
$\Delta t = 3,21$s or/of $\Delta t = 0,25$s
$\Delta t = 3,21$s ✓</td></tr>
</table>
</td><td></td></tr>
</table>

		OPTION/*OPSIE* 3 Time taken to reach maximum height from the ground./ *Tyd om maksimum hoogte bo grond te bereik* $v_f = v_i + g\Delta t$ $0 = -17 + 9{,}8\Delta t$ $\Delta t = 1{,}73$ s✓ From the maximum height to the top of the building/ *Vanaf maksimum hoogte tot bopunt van gebou* $v_f = v_i + a\Delta t$ $14{,}51$ ✓$= 0 + 9{,}8\Delta t$ $\Delta t = 1{,}48$ s✓ The total time from the point from the ground to the top of the building: *Totale tyd vanaf grond tot bopunt van gebou* $\Delta t_{total} = 1{,}73 + 1{,}48 = 3{,}21$ s ✓	**OPTION/*OPSIE* 4** Time taken to reach maximum height from the ground./ *Tyd om maksimum hoogte te bereik bo grond te bereik* $v_f = v_i + g\Delta t$ $0 = 17 + -9{,}8\Delta t$ $\Delta t = 1{,}73$ s ✓ From the max height to the top of the building/ *Vanaf maksimum hoogte tot bopunt van gebou* $v_f = v_i + a\Delta t$ $-14{,}51$✓$= 0 + -9{,}8\Delta t$ $\Delta t = 1{,}48$ s✓ The total time from the point from the ground to the top of the building: *Totale tyd vanaf grond tot bopunt van gebou* $\Delta t_{total} = 1{,}73 + 1{,}48 = 3{,}21$ s ✓	(4)
3.3		**OPTION/*OPSIE 1*** Velocity vs. time graph (Upwards is positive) *Snelheid vs. tyd grafiek (Opwaarts positief)*  	

OPTION/*OPSIE 2* Velocity vs. time graph (Downwards is positive)
Snelheid vs. tyd grafiek (Afwaarts *positief*)



Correct shape/Korrekte vorm ✓

(NOTE: The graphs are not drawn to scale. The length on the y-axis between 0 and 17 should be longer than the length between 0 and 14,51)

Criteria to mark the graph/*Kriteria vir merk van grafiek*	**Marks/Punte**
Graph starts at v = 17 m·s^{-1}/-17 m·s^{-1} and t = 0 s *Grafiek begin by v = 17 m·s^{-1}/-17 m·s^{-1} en t = 0 s*	✓
Graph cuts t-axis at 1,73 s at v = 0 m·s^{-1} *Grafiek sny t-as by 1,73 s* by v = 0 m·s^{-1}	✓
Graph shows the ball bouncing with v = -14.51 m·s^{-1}/ 14,51 m·s^{-1} at t = 3,21 s *Grafiek toon die bal bons met v = -14,51 m·s^{-1}/14,51 m·s^{-1} by t = 3,21 s*	✓

(NOTE: The graphs are not drawn to scale. The length on the y-axis between 0 and 17 should be longer than the length between 0 and 14,51)

(4)

[15]

QUESTION 4

4.1

The total linear momentum in a closed system remains constant./is conserved /
Die totale lineêre momentum in 'n geslote stelsel bly konstant/bly behoue. ✓✓

OR/*OF*

In a closed/isolated system, the total momentum before a collision is equal to the total momentum after the collision./*In 'n geslote/geïsoleerde stelsel is die totale momentum voor 'n botsing gelyk aan die totale momentum na die botsing.*

(2)

4.2 4.2.1

$\sum p_i = \sum p_f$✓
$m_1v_{1i} + m_2v_{2i} = m_1v_{1f} + m_2v_{2f}$
$(m_1 + m_2)v_i = m_1v_{1f} + m_2v_{2f}$

0✓ $= (0,4)v_{1f} + 0,6\,(4)$✓
$v_{1f} = -6\ m\cdot s^{-1}$
$= 6\ m\cdot s^{-1}$ to the left/*na links*✓

(4)

4.2.2

OPTION 1/*OPSIE 1*	**OPTION 2/*OPSIE 2***
$\Delta p = F_{net}\Delta t$✓ $[(0,6)(4) - 0]$✓ $= F_{net}\,(0,3)$✓ $F_{net} = 8$ N✓ **OR/*OF*** $m(v_f - v_i) = F_{net}\Delta t$✓ $0,6(4 - 0)$✓$= F_{net}(0,3)$✓ $F_{net} = 8$ N✓	$v_f = v_i + a\,\Delta t$ $4 = 0 + a(0,3)$ $a = 13,33\ m\cdot s^{-2}$ $F_{net} = ma$ $= 0,6(13,33)$ $F_{net} = 8$ N✓
OPTION 3/*OPSIE 3*	**OPTION 4/*OPSIE 4***
$\Delta p = F_{net}\Delta t$✓ $[(0,4)(6) - 0]$✓ $= F_{net}\,(0,3)$✓ $F_{net} = 8$ N✓ **OR/*OF*** $m(v_f - v_i) = F_{net}\Delta t$✓ $0,4(6 - 0)$✓$= F_{net}(0,3)$✓ $F_{net} = 8$ N✓	$v_f = v_i + a\,\Delta t$ $6 = 0 + a(0,3)$ $a = 20\ m\cdot s^{-2}$ $F_{net} = ma$ $= 0,4(20)$ $F_{net} = 8$ N✓

(4)

4.3

Greater than/*groter as* ✓

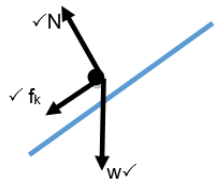
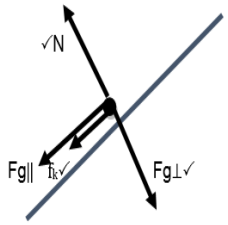
(1)

[11]

QUESTION 5		
5.1	Option 1 $(E_P + E_K)_A = (E_P + E_K)_B$✓ $mgh + \frac{1}{2}mv^2 = mgh + \frac{1}{2}mv^2$ $3(9.8)(1,5)$✓ + 0 = 0 + $\frac{1}{2}(3)v^2$✓ $v = 5{,}42\ m.s^{-1}$ Option 2 $W_{net} = \Delta E_K$✓ $W F_{g\parallel} = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2$ $mgsin\theta\Delta xcos\theta = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2$ | $3(9.8)\frac{1,5}{\Delta x}\ \Delta x \cos 0°$✓ = $\frac{1}{2}(3)v^2 - 0$✓ $v = 5{,}42\ m.s^{-1}$ Option 3: $W_{nc} = \Delta E_p + \Delta E_k$ √ 0√ = mg(h_f - h_i) + ½m(v_f^2 - v_i^2) 0 = 3 x 9,8 (0 - 0,15)√ + ½ x 3 (v_f^2 - 0^2)√ v_f = 5,42 $m.s^{-1}$ √	(3)
5.2	0 J ✓ net force = 0/ constant velocity/E_K is the same/ only F_g present✓ 0 J. *Nul resulterende krag/ konstante snelheid/kinetiese energie is die selfde/slegs konserwatiewe kragte is teenwoordig*	(2)
5.3	Net work done on an object is equal to the change in the object's kinetic energy.✓✓ OR The work done on an object by a net force is equal to the change in the object's kinetic energy. ✓✓ *Die netto/totale arbeid op 'n voorwerp verrig is gelyk aan die verandering in die kinetiese energie van die voorwerp* *OF* *Die arbeid verrig op 'n voorwerp deur 'n resulterende/netto krag is gelyk aan die voorwerp se verandering in kinetiese energie.*	(2)

Commented [9]: I added option 3

Commented [10]: Thank you

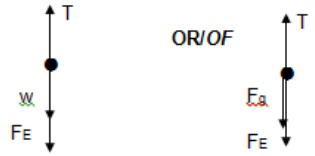
5.4	 **OR** 	(3)
5.5	Option 1 $W_{net} = \Delta E_K$✓ $W_f + W_{Fg\parallel} = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2$ -30✓$+ mgsin\theta\ \Delta x\ cos\ 180° = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2$ $-30 + 3(9.8)\frac{h}{5}(5)(-1)$✓$= 0 - \frac{1}{2}(3)(5{,}42)^2$✓ $h = 0{,}48m$✓ Option 2 $W_{net} = \Delta E_K$✓ $W_f + W_{Fg\parallel} = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2$ -30✓$+ mgsin\theta\ \Delta x\ cos\ 180° = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2$ $-30 + 3(9.8)\sin\theta\,(5)(-1)$✓$= 0 - \frac{1}{2}(3)(5{,}42)^2$✓ $\sin\theta = 0{,}248$ $\frac{h}{5} = 0{,}096$ $h = 0{,}48m$✓ Option 3: $W_{nc} = \Delta E_p + \Delta E_k$ √ -30√ $= mg(h_f - h_i) + \frac{1}{2}m(v_f^2 - v_i^2)$ $-30 = 3 \times 9{,}8\ (0 - h)$√ $+ \frac{1}{2} \times 3\ (0^2 - 5{,}42^2)$√ $h = 0{,}48$ m √	(5)
		[15]

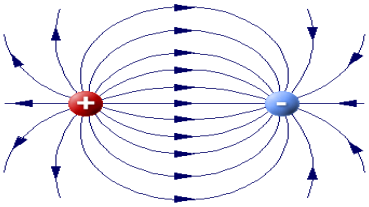
QUESTION 6	

6.1	It is the (apparent) change in frequency (or pitch) of the sound (detected by a listener) ✓because the sound source and the listener have different velocities relative to the medium of sound propagation. ✓ OR An (apparent) change in (observed/detected) frequency (pitch), (wavelength)✓ as a result of the relative motion between a source and an observer ✓ (listener).		(2)
6.2	6.2.1	170 Hz	(1)
	6.2.2	130 Hz	(1)
6.3	$f_L = \frac{v \pm v_L}{v \pm v_s} f_s$ ✓ $170 = \left(\frac{(340+0)}{(340-v_s)}\right) f_s$ ✓ ✓ ---------- (1) $130 = \left(\frac{(340-0)}{340+v_s}\right) f_s$ ✓ ✓ ---------- (2) $v_s = 45{,}33\ m \cdot s^{-1}$ ✓ $(45{,}33 - 45{,}45\ m \cdot s^{-1})$		(6)
6.4	ANY ONE/ENIGE EEN Doppler flow meter/*Doppler-vloeimeter* Measuring foetal heartbeat/*Meet van fetale hartslag* Measure speed of blood flow/*Meet spoed van bloedvloei* Ultra sound/*Ultraklank* Sonar Radar (for speeding/*vir jaag*)		(1)
6.5	The red shift occurs when the spectrum of a distant star moving away from the earth is shifted toward the red end of the spectrum. ✓✓ *Rooi verskuiwings vind plaas wanneer die spektrum van 'n vêr afgeleë ster wat vanaf die aarde wegbeweeg na die rooi ent van die spektrum skuif.*		(2)
			[13]

QUESTION 7	

Commented [11]: 6.3: 3/6 if candidate take fs = 150 Hz. (fs is in fact 147,33 Hz)
give the first three marks

7.1	The force of attraction that two charges at rest exert on each other is directly proportional to the product of the two charges✓ and inversely proportional to the square of the distance between their centres.✓ *Die aantrekkingskrag wat twee ladings in rus op mekaar uitoefen is direk eweredig aan die produk van die twee ladings en✓omgekeerd eweredig aan die vierkant van die afstand tussen die middelpunte.✓*	(2)
7.2	 **Accepted labels/*Aanvaarde byskrifte*** W: F_g/F_w/weight/mg/gravitational force / *F_g/F_w/gewig/mg/gravitasiekrag* T: FT/tension / *FS/spanning* FE: Felectrostatic/FQ1Q2 /Coulomb force/F / *FelektrostatieseFQ1Q2 /Coulomb krag/F*	(3)
7.3	$F_{net} = 0$ $mg + F_E = T$ $mg + k\frac{Q_1Q_2}{r^2} - T = 0$ ✓ $(0,007)(9,8)$✓ $+ (9\times10^9)\frac{(32\times10^{-9})(55\times10^{-9})}{(1.52)^2}$ ✓ $= T$ $\therefore T = 0,137$ N ✓ **ACCEPT/*AANVAAR*** $F_E = wQ2$ ✓ $(0,007)(9,8)$ ✓+ $(0,007)(9,8)$✓✓ $= T$ $T = 0,137$ N ✓	(5)
		[10]

QUESTION 8		
8.1	The <u>electric force</u> ✓ <u>per unit charge</u> ✓ at that point.	(2)
8.2	 Mark allocation: Number of electric field lines from both spheres the same✓ Correct direction of electric field lines ✓ Correct pattern✓	(3)
8.3	**OPTION 1:** $E_{A\,at\,X} = \frac{kQ}{r^2}$ ✓ $= \frac{(9 \times 10^9)(2 \times 10^{-9})}{(3 \times 10^{-2})^2}$ ✓ $= 20\,000\ N/C$, right ✓ $E_{B\,at\,X} = \frac{kQ}{r^2}$ $= \frac{(9 \times 10^9)(2 \times 10^{-9})}{(6 \times 10^{-2})^2}$ ✓ $= 5\,000\ N/C$, right ✓ $\therefore E_{net\,at\,X} = 25\,000\ N/C$, right ✓	

OPTION 2:

$$F_{A\ at\ X} = \frac{kQ_1Q_2}{r^2}$$

$$= \frac{(9 \times 10^9)(2 \times 10^{-9})(1)}{(3 \times 10^{-2})^2}$$

$= 20\ 000\ N$, right ✓

$$F_{B\ at\ X} = \frac{kQ_1Q_2}{r^2}$$

$$= \frac{(9 \times 10^9)(2 \times 10^{-9})(1)}{(6 \times 10^{-2})^2}$$

$= 5\ 000\ N$, right ✓

$\therefore F_{net\ at\ X} = 25\ 000\ N$, right ✓

$$\therefore E_{net\ at\ X} = \frac{F_{net\ at\ X}}{q} \checkmark$$

$$= \frac{25000}{1} \checkmark$$

$= 25000\ \ N/C$, right ✓

(6)

[11]

QUESTION 9		
9.1	$I = V/R$ ✓ $= 4/4$ ✓ $= 1$ A ✓	(3)
9.2	Opsie 1: (I parallel) : One branch (4 + 4 = 8 Ω) current is 1 A. The 16 Ω branch current is 1 A/2 = 0,5 A✓ (dubbel resistance means half the current) $I_{tot} = I_2 = 1 + 0,5$ ✓ $= 1,5$ A ✓ Opsie 2: $V_p = 2 \times 4 = 8$ V therefore $V(R_1) = 20 - 8 = 12$ V $I(R_1) = V/R$ ✓ $= 12/8$ ✓ $= 1,5$ A ✓	(3)
9.3	$1/R_p = 1/R_1 + 1/R_2$ $= 1/(4+4) + 1/16$ ✓ $= 3/16$ ✓ $= 5,33\ \Omega$ ✓ **or** $R_p = R_1 \times R_2 / R_1 + R_2$ ✓ $= 8 \times 16 / 8 + 16$ ✓ $= 5,33\ \Omega$ ✓	(3)
9.4	emf $= I (R + r)$ ✓ $24 = 1,5 [(5,33 + 8) + r]$ ✓ $24 = 19,995 + 1,5\ r$ $r = 2,67\ \Omega$ ✓ OR V(int) = Ir. ✓ 4 = 1,5 x r. ✓ r = 2,67 ohm ✓	(3)
9.5	With S open the total resistance increases and the current decreases. ✓	

	emf = IR + Ir , emf and r is constant thus Ir will decrease. Therefore V_1 will increase ✓ *Wanneer S oop is neem die totale weerstand van die stroombaan toe, dus sal die stroom afneem* *Emk = IR + Ir, emk en r bly konstant daarom sal Ir afneem, dus sal V_1 toeneem*		(2)
			[14]

QUESTION 10			
10.1.	Move the bar magnet very quickly up✓ and down inside the coil ✓ *Beweeg die staafmagneet baie vinnig op en af binne in die spoel.*		(2)
10.2.	10.2.1	Electromagnetic induction/*Elektromagnetiese induksie* ✓	(1)
	10.2.2	Commutator/*kommutator* / split ring/*splitring* ✓	(1)
10.3	10.3.1		

		OPTION 1/*OPSIE 1* $P_{average} = \frac{V_{rms}^2}{R}$ ✓ $= \frac{220^2}{40,33}$ ✓ $= 1\,200,10\ W\ (J \cdot s^{-1})$ ✓ **OPTION 2/*OPSIE 2*** $I_{rms} = \frac{V_{rms}}{R}$ $= \frac{220}{40,33}$ ✓ $= 5,45\ A$ $P_{average} = I_{rms}^2 R$ $= (5,45^2)(40,33)$ ✓ $= 1\,197,9\ W$ **OR/*OF*** $1\,200,10\ W$ ✓ **OPTION 3/*OPSIE 3*** $I_{rms} = \frac{V_{rms}}{R}$ $= \frac{220}{40,33}$ ✓ $= 5,45\ A$ $P_{average} = V_{rms} I_{rms}$ $= (220)(5,45)$ ✓ $= 1\,199\ W$ **or/*of*** $1\,200,10\ W$ ✓ $W = \frac{V_{rms}^2}{R} \Delta t$ ✓ $= \frac{220^2}{40,33}(1)$ $= 1200,10\ J$ ✓ $I_{rms} = \frac{V_{rms}}{R}$ $= \frac{220}{40,33}$ ✓ $= 5,45\ A$ $W = I_{rms}^2 R \Delta t$ $= (5,45^2)(40,33)(1)$ ✓ $= 1\,197,9\ J$ **OR/*OF*** $1\,200,10\ J$ ✓ $I_{rms} = \frac{V_{rms}}{R}$ $= \frac{220}{40,33}$ ✓ $= 5,45\ A$ $W = V_{rms} I_{rms} \Delta t$ $= (220)(5,45)(1)$ ✓ $= 1\,199\ J$ **or/*of*** $1\,200,10\ J$ ✓	(3)
	10.3.2	**OPTION 1/*OPSIE 1*** $V_{rms} = \frac{V_{max}}{\sqrt{2}}$ ✓ $220 = \frac{V_{max}}{\sqrt{2}}$ $V_{max} = 311,13\ V$ ✓ $I_{max} = \frac{V_{max}}{R} = \frac{311,13}{40,33}$ ✓ $= 7,71\ A$ ✓ **OR/OF** $P_{ave} = \frac{V_{max} I_{max}}{2}$ ✓ ✓ $1200,1 = \frac{(311,13) I_{max}}{2}$ ✓ $I_{max} = 7,71\ A$ ✓	

		OPTION 2/*OPSIE 2* $P_{average} = V_{rms} I_{rms}$ ✓ $1200,1 = (220) I_{rms}$ ✓ $I_{rms} = 5,455$ A $I_{max} = \sqrt{2}\,(5,455)$ ✓ $= 7,71$ A✓ (7,715 A) **OPTION 3/*OPSIE 3*** $P_{average} = I^2_{rms} R$ ✓ $1200,1 = I^2_{rms}(40,33)$ ✓ $I_{rms} = 5,455$ A $I_{max} = \sqrt{2}\, I_{rms}$ ✓ $= \sqrt{2}\,(5,455)$ $= 7,71$ A✓ **OPTION 4/*OPSIE 4*** $V_{rms} = I_{rms} R$ ✓ $220 = I_{rms}(40,33)$ ✓ $I_{rms} = 5,455$ A $I_{max} = \sqrt{2}\, I_{rms}$ ✓ $= \sqrt{2}\,(5,455)$ $= 7,71$ A✓	(4)
			[11]

QUESTION 11			
11.1	11.1.1	Photoelectric effect/*foto-elektriese effek*✓	(1)
	11.1.2	Increase*/neem toe*✓ An increase in intensity, will result in more electrons being emitted per second/time unit / *'n toename in intensiteit lei tot meer elektrone wat per sekonde/tydseenheid vrygestel word*✓	(2)
	11.1.3	Increase in Kinetic Energy/ *toename in kinetiese energie*✓ Blue light has higher frequency than red light/*blou lig het 'n hoër frekwensie as rooi lig*✓ Therefore the energy of blue is higher than red because E = hf/*daarom is die energie van blou lig hoër omdat E = hf*✓	(3)
11.2			

	$E = W_0 + K_{max}$ ✓ $2,95 \times 10^{-20}$ ✓$= 1 \times 10^{-20}$ ✓ $+ 0,5 (9,11 \times 10^{-31}) v^2$ ✓ $v = 2,07 \times 10^5 \text{ m.s}^{-1}$ ✓		(5)
			[11]

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