education

Department of Education
FREE STATE PROVINCE

CONTROL TEST / *KONTROLETOETS*

GRADE 11 / *GRAAD 11*

PHYSICAL SCIENCES
FISIESE WETENSKAPPE

MEMORANDUM

SEPTEMBER 2019

MARKS: 100 / *PUNTE: 100*

TIME: 2 HOURS / *TYD: 2 UUR*

This memorandum consists of seven pages
Hierdie memorandum bestaan uit sewe bladsye.

QUESTION 1/*VRAAG 1*

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

QUESTION 2/*VRAAG 2*

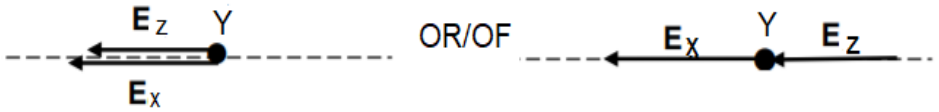
2.1 The magnitude of the electrostatic force exerted by two point charges (Q_1 and Q_2) on each other is directly proportional to the product of magnitudes of the charges ✓ and inversely proportional to the square of the distance between them. ✓ / *Die grootte van die elektrostatiese krag wat deur twee puntladings (Q_1 en Q_2) op mekaar uitgeoefen word is direk eweredig aan die produk van groottes van die ladings en omgekeerd eweredig aan die kwadraat van die afstand tussen hulle*. (2)

2.2
$$F_{XY} = \frac{k Q_1 Q_2}{r^2} \checkmark$$
$$= \frac{(9 \times 10^9)(3 \times 10^{-6})(2 \times 10^{-6})}{(0,2)^2} \checkmark$$
$$= 1,35 \text{ N}$$

$$F_{YZ} = \frac{k Q_1 Q_2}{r^2}$$
$$= \frac{(9 \times 10^9)(3 \times 10^{-6})(2 \times 10^{-6})}{(0,3)^2} \checkmark$$
$$= 0,6 \text{ N}$$

$$F_{net} = F_{XY} + F_{YZ} \checkmark$$
$$= 1,35 + 0,6$$
$$= 1,95 \text{ N} \checkmark \text{left} \checkmark$$ (6)

2.3



Vectors E_x and E_z to the left✓✓/ Vektore E_x en E_z na links
Correct drawing of vectors E_x and E_z ✓/ Korrekte tekening van vektore E_x en E_z
E_x longer than E_z ✓/ E_x langer as E_z (4)

2.4 $E_{net} = \frac{F_{net}}{Q}$ ✓

$= \frac{1,95✓}{2\times10^{-6}✓}$

$= 9,75 \times 10^5 N.C^{-1}$✓ to the left ✓/ *na links*

OR/*OF*

$E_X = \frac{F_X}{Q}$ $E_Z = \frac{F_Z}{Q}$ ✓

$= \frac{1,35}{2\times10^{-6}}$ ✓ $= \frac{0,6}{2\times10^{-6}}$ ✓

$= 6,75 \times 10^5 N.C^{-1}$ $= 3 \times 10^5 N.C^{-1}$

$E_{net} = E_x + E_z$

$= 9,75 \times 10^5 N.C^{-1}$✓ to the left ✓/ *na links*

OR/*OF*

$E_X = \frac{kQ}{r^2}$ $E_z = \frac{kQ}{r^2}$ ✓

$= \frac{(9\times10^9)(3\times10^{-6})}{(0,2)^2}$ ✓ $= \frac{(9\times10^9)(3\times10^{-6})}{(0,3)^2}$ ✓

$= 6,75 \times 10^5 N.C^{-1}$ $= 3 \times 10^5 N.C^{-1}$

$E_{net} = E_x + E_z$

$= 9,75 \times 10^5 N.C^{-1}$✓ to the left ✓/ *na links* (5)

[17]

QUESTION 3/ VRAAG 3

3.1 The magnitude of the induced emf across the ends of a conductor ✓ is directly proportional to the rate of change in the magnetic flux linkage with the conductor. ✓ / *Die grootte van die geïnduseerde emk oor die geleier is direk eweredig aan die tempo van verandering van die magnetiese vloedkoppeling met die geleier.* (2)

3.2 When the magnet moves in: it will show a reading. ✓
When the magnetic remains stationary: reading will be zero. ✓
When the magnet is pulled out: it will show a reading but with an opposite direction to the first reading. ✓ /
As die magneet ingaan: dit wys 'n lesing.
As die magneet stilstaande bly: *lesing is nul*.
Wanneer die magneet uitgetrek word: *dit wys 'n lesing, maar in die teenoorgestelde rigting as die eerste lesing.* (3)

3.3 N to/*na* M ✓ (1)

3.4 Increase the number of turns/ coils of the solenoid. ✓
Use stronger magnets. ✓
Increase the rate of change in the magnetic flux linkage. ✓/
Vermeerder die aantal windings / spoele van die solenoïde.
Gebruik sterker magnete.
Verhoog die veranderingstempo van die magnetiese vloedkoppeling. (3)

3.5 $\mathrm{A} = \ell \times \mathrm{b}$
$= 0{,}04 \times 0{,}04$✓
$= 0{,}0016\ \mathrm{m}^2$

$\emptyset = BA\cos\theta$ ✓
$= (0{,}03)(0{,}0016)\cos 0°$✓
$= 4{,}8 \times 10^{-5}\ Wb$

$\mathcal{E} = -N\frac{\Delta\emptyset}{\Delta t}$ ✓
$= -(50)$ ✓ $\frac{4{,}8\times10^{-5}-0}{1{,}5-0}$✓
$= -1{,}6 \times 10^{-3}\ V$✓
ACCEPT / *AANVAAR*
$= 1{,}6 \times 10^{-3}\ V$ (7)

[16]

QUESTION 4 / VRAAG 4

4.1 The potential difference across a conductor is directly proportional to the current in the conductor at a constant temperature. ✓✓ / *Die potensiaalverskil oor 'n geleier is direk eweredig aan die stroom deur die geleier by 'n konstante temperatuur.* (2)

4.2

OPTION 1/*OPSIE 1*	**OPTION 2/*OPSIE 2***
$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2}$ ✓ $= \frac{1}{4} + \frac{1}{3}$ ✓ $R_P = 1{,}71\ \Omega$ ↙ $R_T = 1{,}71 + 2$ ✓ $= 3{,}71\ \Omega$ ✓	$R_P = \frac{R_1 \times R_2}{R_1 + R_2}$ ✓ $= \frac{4 \times 3}{4 + 3}$ ✓ $= 1{,}71\ \Omega$ ↓ $R_T = 1{,}71 + 2$ ✓ $= 3{,}71\ \Omega$ ✓
OPTION 3/*OPSIE 3*	
$R_T = R_S + [\frac{R_1 + R_2}{R_1 \times R_2}]^{-1}$ ✓ $= 2$ ✓ $+ [\frac{4+3}{4 \times 3}]^{-1}$ ✓ $= 3{,}71\ \Omega$ ✓	

(4)

4.3 **POSITIVE MARKING FROM 4.2/*POSITIEF NASIEN VAN 4.2***

$R = \frac{V}{I}$ ✓
$3{,}71 = \frac{24}{I}$ ✓
$I = 6{,}47\ A$ ✓ (3)

4.4 **POSITIVE MARKING FROM 4.3 & 4.2/*POSITIEF NASIEN VAN 4.3 & 4.2***

$R = \frac{V}{I}$
$1{,}71$ ✓ $= \frac{V}{6{,}47}$ ✓
$V = 11{,}06\ V$ ✓ (3)

4.5 **POSITIVE MARKING FROM 4.3 & 4.4/*POSITIEF NASIEN VAN 4.3 & 4.4***

$P = I^2R$ ✓
$= (6{,}47^2)(2)$ ✓
$= 83{,}72\ W$ ✓ (3)

4.6 Decreases/*Afneem* ✓ (1)
[16]

QUESTION 5/ VRAAG 5

5.1 Rate at which work is done or energy transferred. ✓✓ / *Die tempo waarteen werk of energie oorgedra word.* (2)

5.2
$$P = VI$$
$$= (220)(20)\checkmark$$
$$= 4400$$
$$= 4{,}4 \text{ kW}$$

$$P = \frac{W}{\Delta t}\checkmark$$
$$4{,}4\checkmark = \frac{W}{0{,}033}\checkmark$$
$$W = 0{,}15 \text{ kWh}$$

$$\text{Cost of electricity} = \text{energy used} \times \text{tariff / } Koste = \text{energie verbruik} \times \text{tarief}$$
$$= 0{,}15 \times 1{,}15\checkmark$$
$$= \text{R } 0{,}17\checkmark$$ (6)

[8]

QUESTION 6/*VRAAG 6*

6.1
$$n_C = \frac{m}{M}\checkmark$$
$$= \frac{40}{12}\checkmark$$
$$= 3{,}33 \text{ mol}$$

$$n_H = \frac{m}{M}$$
$$= \frac{6{,}7}{1}\checkmark$$
$$= 6{,}7 \text{ mol}$$

$$n_O = \frac{m}{M}$$
$$= \frac{53{,}3}{16}\checkmark$$
$$= 3{,}33 \text{ mol}$$

$$C : H : O$$
$$\frac{3{,}33}{3{,}33} : \frac{6{,}7}{3{,}33} : \frac{3{,}33}{3{,}33}$$
$$1 : 2 : 1\checkmark$$

$$\text{Empirical formula} = CH_2O\checkmark / \textit{Empiriese formula} = CH_2O$$ (6)

6.2 Whole mass $= \frac{\text{M of lactic acid}}{\text{M of empirical formula}}$ / $Massa = \frac{\text{M van melksuur}}{\text{M van empiriese formule}}$

$= \frac{90}{30}$ ✓

$= 3$

Molecular Fomula $= C_{(1\times3)}H_{(2\times3)}O_{(1\times3)} = C_3H_6O_3$✓ /

$Molekulêre\ Fomule = C_{(1\times3)}H_{(2\times3)}O_{(1\times3)} = C_3H_6O_3$ (2)

[8]

QUESTION 7 / *VRAAG 7*

7.1.1 $c = \frac{n}{V}$✓

$0,1 = \frac{n}{0,15}$✓

$n = 0,015$ mol✓ (3)

7.1.2 $n = \frac{V}{V_m}$✓

$= \frac{0,1}{22,4}$✓

$= 0,0045$ mol✓

OR/*OF*

$pV = nRT$ ✓

$(101,3x10^3)(0,1x10^{-3}) = n(8,31)(273)$ ✓

$n = 4,47x10^{-3}\ mol$ ✓ (3)

7.1.3 $n_{(CO_2)} : n_{(CaCO_3)}$

$1 : 1$

$0,0045$ mol : $0,0045$ mol✓

$n = \frac{m}{M}$ ✓

$0,0045 = \frac{m}{40 + 12 + 3(16)}$✓

$m = 0,45$ g

$\% = \frac{0,45}{0,5} \times 100$ ✓ $= 90\ \%$✓ (5)

7.2 $M_{C4H10} = 4(12) + 10(1) = 58$ ✓

$\%\ C = \frac{4(12)}{58} \times 100$ ✓ $= 82,76\%$ ✓

$\%\ H = \frac{10}{58} \times 100 = 17,24\%$✓ (4)

[15]

GRAND TOTAL/GROOT TOTAAL: 100