education

Department of Education
FREE STATE PROVINCE

CONTROL TEST / *KONTROLETOETS*

GRADE 11 / *GRAAD 11*

PHYSICAL SCIENCES
FISIESE WETENSKAPPE

MEMORANDUM

SEPTEMBER 2017

MARKS: 100 / *PUNTE: 100*

TIME: 2 HOURS / *TYD: 2 URE*

This memorandum consists of FIVE pages.
Hierdie memorandum bestaan uit VYF bladsye.

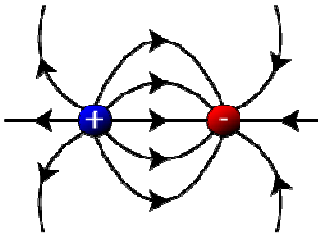
QUESTION 1/*VRAAG 1*

1.1 A ✓✓ (2)
1.2 C ✓✓ (2)
1.3 A ✓✓ (2)
1.4 D ✓✓ (2)
1.5 D ✓✓ (2)
1.6 A ✓✓ (2)
1.7 B ✓✓ (2)
1.8 A ✓✓ (2)
1.9 C ✓✓ (2)
1.1.0 D ✓✓ (2)

[20]

QUESTION 2/*VRAAG 2*

2.1.1



CRITERIA/*KRITERIA*	MARK *PUNT*
Shape of electric field; field lines do not touch or cross. *Patroon van elektries veld; elektriese veldlyne raak of kruis nie.*	1
Direction of electric field (from positive to negative charge). *Rigting van elektriese veld (van positiewe na negatiewe lading).*	1

(2)

2.1.2 $E = \frac{kQ}{r^2}$ ✓ $= \frac{9 \times 10^9 \times 12 \times 10^{-6}}{0,2^2}$ ✓ $= 2,7 \times 10^6 \text{ N} \cdot \text{C}^{-1}$ ✓ (3)

2.2.1 The magnitude of the electrostatic force exerted by one point charge (Q_1) on another point charge (Q_2) is directly proportional to the product of the magnitudes of the charges ✓ and inversely proportional to the square of the distance (r) between them. ✓ /

Die grootte van die elektrostatiese krag wat een puntlading (Q_1) op 'n ander puntlading uitoefen (Q_2) is direk eweredig aan die produk van die groottes van die ladings ✓ en omgekeerd eweredig aan die kwadraat van die afstand (r) tussen hulle. ✓ (2)

2.2.2 $F = \frac{kQ_1Q_P}{r^2}$ ✓

$F = \frac{(9\times10^9)(14\times10^{-6})(10\times10^{-6})}{(0,1)^2}$ ✓ $= 126 \text{ N}$

$F = \frac{kQ_2Q_P}{r^2}$ ✓

$F = \frac{(9\times10^9)(12\times10^{-6})(10\times10^{-6})}{(0,15)^2}$ ✓ $= 48 \text{ N}$

$F_{net} = \sqrt{126^2 + 48^2}$ ✓ $= 134,83 \text{ N}$ ✓ (6)

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QUESTION 3/*VRAAG 3*

3.1.1 Galvano meter / *Galvanometer* ✓ (1)

3.1.2 Y to X / *Y na X* (✓✓) (2)

3.1.3 S pole / *S-pool* ✓ (1)

3.2 The magnitude of the induced emf induced 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 ente van 'n geleier is direk eweredig ✓ *aan die tempo van verandering van magnetiese vloedkoppeling met die geleier*. ✓ (2)

3.3 $\Delta\Phi = (B_f - B_i)A\cos\theta$ ✓ $= (1 - 0,5)(0,5)^2\cos 0°$ ✓ $= 0,125$ Wb

$$\varepsilon = -N\frac{\Delta\Phi}{\Delta t} \checkmark = -5 \times \frac{0,125}{10} \checkmark = -0,06\,V \checkmark$$

Accept if negative is not shown./*Aanvaar as negatief nie gewys is nie*. (6)

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QUESTION 4/*VRAAG 4*

4.1 Current / *Stroom* ✓ (1)

4.2.1 (4;0,63) Allow for y between/*Aanvaar vir y tussen*: 0,62 - 0,64 ✓✓ (2)

4.2.2 Temperature increases. /*Temperatuur verhoog.* ✓
R increase; gradient decrease / *R neem toe; gradiënt neem af.* ✓ (2)

4.3 $$\text{Gradient} \overset{\checkmark}{=} \frac{\Delta I}{\Delta V} = \frac{0,63 - 0}{4 - 0} \checkmark = 0,158\,A \cdot V^{-1}\ (\Omega^{-1})$$

$$R = \frac{1}{0,158} \checkmark = 6,35\,\Omega \checkmark$$ (4)

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QUESTION 5/*VRAAG 5*

5. 1 $R = \frac{V}{I} \checkmark = \frac{20}{4} \checkmark = 5\,\Omega \checkmark$ (3)

5.2 $V_2 = IR = 4 \checkmark \times 3{,}2 \checkmark = 12{,}8\ V$ $V_1 = 20 - 12{,}8 \checkmark = 7{,}2\ V \checkmark$ (4)

5.3

OPTION 1 / *OPSIE* 1 Positive marking from 5.2. *Positiewe nasien vanaf 5.2.*	**OPTION 2 / *OPSIE* 2** Positive marking from 5.1. *Positiewe nasien vanaf 5.1.*
$I_{3\Omega} = \frac{V}{R} \checkmark = \frac{7{,}2}{3} \checkmark = 2{,}4\ A$ $I_R = I_T - I_{3\Omega} = 4 - 2{,}4 \checkmark = 1{,}6\ A$ $R = \frac{V}{I} = \frac{7{,}2}{1{,}6} \checkmark = 4{,}5\ A \checkmark$	$R_P = R_{TOT} - R_{3,2\Omega}$ $= 5 - 3{,}2 \checkmark = 1{,}8\ \Omega$ $\frac{1}{R_{//}} = \frac{1}{R} + \frac{1}{R_3} \checkmark \Rightarrow \checkmark \frac{1}{1{,}8} = \frac{1}{R} + \frac{1}{3} \checkmark$ $\frac{1}{R} = \frac{2}{9}$ $R = 4{,}5\ \Omega \checkmark$

(5)

5.4 **Positive marking from 5.1 to 5.3/*Positiewe nasien vanaf 5.1 tot 5.3.***

OPTION 1 / *OPSIE* 1:	**OPTION 2 / *OPSIE* 2:**	**OPTION 3 / *OPSIE* 3:**
$P = I^2R \checkmark$ $= (2{,}4^2)(3) \checkmark$ $= 17{,}28\ W \checkmark$	$P = \frac{V^2}{R} \checkmark = \frac{7{,}2^2}{3} \checkmark = 17{,}28\ W \checkmark$	$P = VI \checkmark$ $= 7{,}2 \times 2{,}4 \checkmark$ $= 17{,}28\ W \checkmark$

(3)

5.5 $\text{Cost / Koste} = \frac{17{,}28}{1000} \checkmark \times 10 \times R\,2{,}20 \checkmark = R\,0{,}38 \checkmark$ (3)

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QUESTION 6/*VRAAG 6*

6.1 The empirical formula is <u>the simplest whole number ratio</u> ✓ of <u>atoms in a compound</u>. ✓
Die empiriese formule is <u>die eenvoudigste heelgetalverhouding</u> ✓ <u>van atome in 'n verbinding</u>.✓ (2)

6.2

	Na	:	Cr	:	O	
	17,5	:	39,7	:	42,8	
n(mol)	$\frac{17{,}5}{23}$	:	$\frac{39{,}7}{52}$	:	$\frac{42{,}8}{16}$	✓
n(mol)	0,76	:	0,76	:	2,675	✓
	1	:	1	:	3,5	✓
	2	:	2	:	7	✓

Formula:/*Formule*: $Na_2Cr_2O_7$ ✓ (5)

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QUESTION 7/*VRAAG 7*

7.1 $n(MgCO_3) = \frac{m}{M}\checkmark = \frac{126}{84}\checkmark = 1{,}5\,mol\checkmark$ (3)

7.2 $m(MgC\ell_2) = n \times M = 3\checkmark \times 95\checkmark = 285\ g\checkmark$ (3)

7.3 $V_{(CO2)} = n \times V_m \checkmark = 6 \times 22{,}4 \checkmark = 134{,}4\ dm^3 \checkmark$ (3)

7.4 $V_{(HC\ell)} = \frac{n}{c}\checkmark = \frac{0{,}4\checkmark}{0{,}5\checkmark} = 0{,}8\ dm^3 \checkmark$ (4)

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QUESTION 8/*VRAAG 8*

8.1

$n(TiC\ell_4) = \frac{m}{M} = \frac{3\,540\,000}{190}\checkmark = 18\,631{,}58\,mol$

$n(Mg) = \frac{m}{M} = \frac{1130\,000}{24}\checkmark = 47\,083{,}33\,mol$

$n(Mg) = 2 \times n(TiC\ell_2)\checkmark$
$= 2 \times 18\,631{,}58\checkmark$
$= 37\,263{,}16\ mol\checkmark$
$\therefore$ Mg in excess/*Mg in oormaat* ✓

OR/*OF*

$n(TiC\ell_4) = 0{,}5 \times n(Mg)\checkmark$
$= 0{,}5 \times 47\,083{,}33\checkmark$
$= 23\,541{,}67\ mol\checkmark$
$\therefore$ $TiC\ell_4$ shortage/*tekort* ✓

$n(Ti) = \frac{m}{M} = \frac{894{,}32 \times 1000}{48}\checkmark$
$= 18631{,}667\ mol$

$n(TiCl4) = \frac{m}{M}$
$18631{,}667\checkmark = \frac{m}{190}\checkmark$
$m = 3540{,}017\ kg\checkmark$
$TiC\ell_4$ is used up/*word opgebruik.*

OR/*OF*

$n(Mg) = \frac{m}{M}$
$2 \times 18631{,}667\checkmark = \frac{m}{24}\checkmark$
$m = 894{,}32\ kg\checkmark$
Mg in excess/*Mg in oormaat* ✓

(6)

8.2

$\%\ Yield\ Ti = \frac{Real\ yield}{Theoretical\ yields}$

$= \frac{820}{894{,}32}\checkmark = 91{,}69\%\checkmark$

$\%\ Opbrengs\ Ti = \frac{Werklike\ opbrengs}{Teoretiese\ opbrengs}$

$= \frac{820}{894{,}32}\checkmark = 91{,}69\%\checkmark$

(2)

[8]

GRAND TOTAL/*GROOTTOTAAL* : 100