education

Department of Education
FREE STATE PROVINCE

This is an updated memo.

GRADE 11 / *GRAAD 11*

PROVINCIAL FORMAL ASSESSMENT TASK

PROVINSIALE FORMELE ASSESSERINGSTAAK

CONTROL TEST 2 2016

MEMORANDUM

PHYSICAL SCIENCES / *FISIESE WETENSKAPPE*

TIME: 2 HOURS

TYD: 2 UUR

MARKS: 100

PUNTE: 100

This memorandum consists of 7 pages.
Hierdie memorandum bestaan uit 7 bladsye.

QUESTION 1/*VRAAG 1*

1.1 A ✓✓ (2)

1.2 B ✓✓ (2)

1.3 A ✓✓ (2)

1.4 B ✓✓ (2)

1.5 B ✓✓ (2)

1.6 C ✓✓ (2)

1.7 C ✓✓ (2)

1.8 C.✓✓ (2)

1.9 A ✓✓ (2)

1.1.0 A ✓✓ (2)
[20]

QUESTION 2/*VRAAG 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. (3)

2.2 $F = \frac{kQ_1Q_2}{r^2}$ ✓

$F = \frac{(9\times10^{9})(4\times10^{-6})(-6\times10^{-6})}{(0,4)^2}$ ✓ ✓

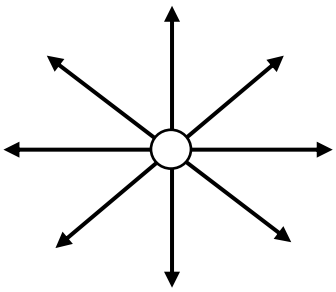
$= -1,35$ N ✓ (4)

2.3 4 ✓ ✓ (2)
[9]

QUESTION 3/*VRAAG 3*

3.1 The force experienced per unit positive charge placed at the point. ✓✓
Die krag ondervind per eenheids positiewe lading by die punt. (2)

3.2



Marking criteria/*Nasienriglyne*	
✓	Correct shape –*Korrekte vorm* -
✓	Symmetry. *simmetrie*
✓	Direction / *Rigting*

(3)

3.3 $E_{net} = 0$ ✓
OR/*OF*
$E_1 + E_2 = 0$

$$\frac{kQ_1}{r_1^2} + \frac{KQ_2}{r_2^2} = 0$$

$$\frac{(9 \times 10^9)(2 \times 10^{-6})}{(0,2 - x)^2} - \frac{(9 \times 10^9)(3 \times 10^{-6})}{x^2} = 0$$

One mark for the substitution of both 9 x 10^9/
Een punt vir beide substitisies van 9 x 10^9

$x = 0,11$ m ✓ (7)
[12]

QUESTION 4/*VRAAG 4*

4.1 The (magnitude of the) emf induced in a conductor is equal to the rate of change of magnetic flux linkage (through it).
Die (grootte van die) geïnduseer emk in 'n geleier is gelyk aan die tempo van verandering van magneetvloedkoppeling (daardeur). ✓✓ (2)

4.2.1 $\varepsilon = -N\frac{\Delta\Phi}{\Delta t}$ ✓

$-15,2$ ✓ $= -(200)\ \frac{\Delta\phi}{3,2 \times 10^{-2}}$ ✓

$\therefore\ \Delta\phi = 2,43 \times 10^{-3}$ Wb ✓ or ($2,43 \times 10^{-3}$ V·s) (4)

4.2.2 $\Delta\phi = (B_f - B_i)A\cos\theta$ ✓

$2,43 \times 10^{-3} = (0,42 - 0,22)A\cos0°$ ✓

$\therefore A = 0,01215\ m^2$

Area of circle = πr^2

$0,01215 = \pi r^2$ ✓

$\therefore r = 6,22 \times 10^{-2}$ m ✓ (4)

4.3 15,2 V ✓ (1)
[11]

QUESTION 5/*VRAAG 5*

5. 1 Resistance = gradient of graph / *Weerstand = gradiënt van die grafiek*

$$= \frac{4-0}{25\times10^{-3}-0} \checkmark$$

$= 160\ \Omega$ ✓ (3)

5. 2 V is directly proportional to I at each of the temperatures T_1 and T_2. ✓
V is direk eweredig aan I by elkeen van die temperature T_1 en T_2 (1)

5.3

OPTION 1/*OPSIE 1*

$P = VI$ ✓
$= (2,5)$ ✓(25×10^{-3}) ✓
$= 0,0625$ W ✓

OPTION 2/*OPSIE 2*

$$R = \frac{V}{I} = \frac{2.5}{25\times10^{-3}} \checkmark = 100\ \Omega$$

$$P = \frac{V^2}{R} \checkmark$$

$$= \frac{(2,5)^2}{100} \checkmark$$

$= 0,0625$ W ✓

OPTION 3/*OPSIE 3*

$$R = \frac{V}{I} = \frac{2.5}{25\times10^{-3}} \checkmark = 100\ \Omega$$

$P = I^2R$ ✓
$= \left(25\times10^{-3}\right)^2 \times 100$ ✓
$= 0,0625$ W ✓

(4)
[8]

QUESTION 6/*VRAAG 6*

6.1 The potential difference across a conductor is directly proportional to the current in the conductor ✓at constant tempearature. ✓
Die potensiaalverskil oor 'n geleier is direk eweredig aan die stroom in die geleier by konstante temperatuur.

OR/*OF*
Provided temperature and other physical conditions are constant, ✓
the potential difference across a conductor is directly proportional to the current. ✓
Met dien verstande dat temperatuur en ander fisiese toestande konstant bly is die potensiaalverskil oor 'n geleier direk eweredig aan die stroom. (2)

6.2.1

OPTION 1/*OPSIE 1*

$V_1 = IR_{6\Omega}$ ✓
$= 0,6\ (6)$ ✓ $= 3,6$ V
$I_{4\Omega} = \frac{3,6}{4}$ ✓ $\therefore I_{4\Omega} = 0,9$ A ✓

OPTION 2/*OPSIE 2*

$V = IR$ ✓
$(0,6)(6) = I_{4\Omega}(4)$ ✓
$I_{4\Omega} = \frac{(0,6)(6)}{4}$ ✓ $= 0,9$ A ✓

(4)

6.2.2 **POSITIVE MARKING FROM QUESTION 6.2.1.**
POSITIEWE NASIEN VAN VRAAG 6.2.1.
$I_{tot} = I_{6\Omega} + I_{4\Omega} = (0,6 + 0,9)$ ✓
$I_{tot} = 1,5$ A ✓ (2)

6.2.3 **POSITIVE MARKING FROM QUESTION 6.2.1 AND QUESTION 6.2.2.**
POSITIEWE NASIEN VAN VRAAG 6.2.1 EN VRAAG 6.2.1.

OPTION 1/*OPSIE* 1

$V_X = V_{tot} - V_1$
$= (6 - 3,6)$ ✓
$= 2,4$ V
$V = IR$ ✓
$X = \frac{2,4}{1,5}$
$= 1,6\ \Omega$ ✓

OPTION 2/*OPSIE 2*

$V_T = I_T R_T$ ✓
$6 = 1,5R_T$
$R_T = 4\ \Omega$
$R_T = R_p + X$
$4 = \left(\frac{1}{4} + \frac{1}{6}\right)^{-1} + x$ ✓
$x = 1,6\ \Omega$ ✓

(3)

6.3 Energy/*Energie* $W = I^2 R\Delta t$ ✓
For the same time interval ✓$I^2R\Delta t$ will be greater for the 4 Ω resistor than for the 6 Ω resistor. ✓ /*Vir dieselfde tyd interval sal $I^2R\Delta t$ groter wees vir die 4 Ω resistor as vir die 6 Ω resistor.*

OR/*OF*

$P = \frac{V^2}{R}$ ✓, for parallel combination V is constant✓/*Vir parallelle kombinasie V konstant*

$P \propto \frac{1}{R}$ ✓ Lower resistance high power. / *Laer weerstand hoër drywing*

OR/*OF*

Energy/*Energie* $W = \frac{V^2}{R}\Delta t$ ✓

For the same potential difference and time ✓ $\frac{V^2}{R}\Delta t$ is greater for the smaller resistance than for the larger resistance. ✓/*Vir dieselfde potensiaalverskil en tyd* $\frac{V^2}{R}\Delta t$ *is groter vir die kleiner weerstand as vir die groter weerstand.*

(3)
[14]

QUESTION 7/*VRAAG 7*

7.1 **OPTION 1 /*OPSIE 1***

In 100 g of the compound/In *100 g van die verbinding:*

	Na	**S**	**O**	
% In 100 g of the compound/ In *100 g van die verbinding:*	$\frac{1,911}{5,235}\times 100$ $=36,504\ \%$ ✓	$\frac{1,329}{5,235}\times 100$ $= 25,387\ \%$ ✓	$\frac{1,995}{5,235}\times 100$ $= 38,109\%$ ✓	
$n = \frac{m}{M}$	$\frac{36,504}{23}$ ✓	$\frac{25,387}{32}$ ✓	$\frac{38,109}{16}$ ✓	
Mole ratio/*Mol verhouding*	1,587	0,793	2,382	
Divide by smallest value *Deel deur kleinste waarde*	$\frac{1,587}{0,793}$	$\frac{0,793}{0,793}$	$\frac{2,382}{0,793}$	✓
Ratio/*Verhouding*	2	1	3	✓

Empirical formula/*Empiriese formule* Na_2SO_3 ✓

OPTION 2 /*OPSIE 2*

	Na	**S**	**O**	
$n = \frac{m}{M}$	$\frac{1,911}{23}$ ✓	$\frac{1,329}{32}$ ✓	$\frac{1,995}{16}$ ✓	
Mole ratio/*Mol verhouding*	0,08 ✓	0,04 ✓	0,12 ✓	
Ratio/*Verhouding*	2	1	3	✓✓

Empirical formula/*Empiriese formule* Na_2SO_3 ✓ (9)

7.2 $M(Na_2SO_3) = 23(2) + 32 + 3(16) = 126\ g\cdot mol^{-1}$

$$\frac{M(\text{compound / } \textit{verbinding})}{M(Na_2SO_3)} = \frac{126}{126}\ \checkmark = 1$$

∴ Molecular formula/*Molekulêre formule*: Na_2SO_3. ✓ (2)
[11]

QUESTION 8/*VRAAG 8*

8.1 One mole is the amount of substance having the same number of particles as there are atoms in 12 g carbon-12. ✓✓
Een mol is die hoeveelheid stof wat dieselfde aantal deeltjies het as wat daar atome in 12g koolstof-12 is. (2)

8.2.1 $n(Fe) = \frac{m}{M} = \frac{20}{56}\checkmark = 0,357$ mol Fe $\qquad$ $n(S) = \frac{m}{M} = \frac{10}{32} = 0,313$ mol S

From balanced equation/ *Van gebalanseerde vergelyking:*
1 mol Fe reacts with 1 mol S / *1 mol Fe reageer met 1 mol S* ✓
n(S) < n(Fe) ✓
The limiting reactant is S./*Die beperkende reaktans is S* ✓ (5)

8.2.2 **POSITIVE MARKING FROM QUESTION/*POSITIEWE NASIEN VAN VRAAG* 8.2.1.**

OPTION 1/*OPSIE 1*	**OPTION 2/*OPSIE 2***
$n(\text{Fe used}) = \frac{m}{M}$ $0{,}313 = \frac{m}{56}$ ✓ ∴ m(Fe used/*gebruik*) = 17,5 g m(excess/*oormaat*) = 20 – 17,5 = 2,5 g ✓	n(Fe) remaining/*wat oorbly* $= \frac{20}{56} - \frac{10}{32} = 0{,}045\ \text{mol}$ ✓ $m = nM = 0{,}045 \times 56 = 2{,}5\ \text{g}$ ✓

(2)

8.3 **Marking criteria/*Nasienriglyne:***

- Substitute/*Vervang* M(MgO) = 40 g·mol^{-1} ✓
- Use ratio of /*Gebruik verhouding van* n(Mg) : n(MgO) = 1 : 1 ✓
- Use/*Gebruik* M(Mg) = 24 g·mol^{-1} ✓
- Calculate m(MgO) = 24 g or n(MgO) = 0,6 mol that will be obtained if 80% yield. ✓
  Bereken m (MgO) = 24 g of n(MgO) = 0,6 mol wat verkry sal word as die opbrengs 80% is.
- Calculate m(Mg) or n(Mg) needed. / *Bereken m (Mg) of n(Mg) nodig* ✓
- Final answer/*Finale antwoord*: 22,5 g ✓

OPTION 1/*OPSIE 1*	**OPTION 2/*OPSIE 2***
$n(\text{MgO}) = \frac{m}{M}$ $= \frac{30}{40}$ ✓ $= 0{,}75\ \text{mol}$ From balanced equation: *Vanaf die gebalanseerde vergelyking:* n(Mg) = n(MgO) = 0,75 mol ✓ $n(\text{Mg}) = \frac{m}{M}$ $0{,}75 = \frac{m}{24}$ ✓ $m(\text{Mg}) = 18\ \text{g}$ If 18 g Mg gives 80% yield, then mass Mg needed for 100% yield: *As 18 g Mg 'n 80% opbrengs gee, dan is die mol Mg wat nodig is vir 100% opbrengs:* 18 g ……24 g MgO ✓ x g ……..30 g ✓ $\therefore m(\text{Mg}) = \frac{(18)(30)}{24} = 22{,}5\ \text{g}$ ✓	$n(\text{MgO}) = \frac{m}{M}$ $= \frac{30}{40}$ ✓ $= 0{,}75\ \text{mol}$ From balanced equation: *Van gebalanseerde vergelyking:* n(Mg) = n(MgO) = 0,75 mol ✓ If 0,75 mol Mg gives 80% yield, then the mol Mg needed for 100% yield: *As 0,75 mol Mg 'n 80% opbrengs gee, dan is die mol Mg wat nodig is vir 100% opbrengs:* 0,75 mol Mg ……..0,6 mol MgO ✓ x mol Mg……..0,75 mol Mg $n(\text{Mg}) = \frac{(0{,}75)(0{,}75)}{0{,}6}$ ✓ $= 0{,}9375\ \text{mol}$ $n(\text{Mg}) = \frac{m}{M}$ ∴ $0{,}9375 = \frac{m}{24}$ ✓ $\therefore m(\text{Mg}) = 22{,}5\ \text{g}$ ✓

(6)
[15]

GRAND TOTAL/*GROOTTOTAAL* : 100

Please turn over/Blaai om asseblief