education

Department of Education
FREE STATE PROVINCE

EXAMINATION / *EKSAMEN*

GRADE 10 / *GRAAD 10*

TECHNICAL SCIENCES
TEGNIESE WETENSKAPPE

MEMORANDUM

NOVEMBER 2019

MARKS: 150 / *PUNTE: 150*

TIME: 3 HOURS / *TYD: 3 UUR*

This memorandum consists of NINE pages.
Hierdie memorandum bestaan uit NEGE bladsye.

QUESTION 1/*VRAAG 1*

1.1 C ✓✓ 1.2 B ✓✓ 1.3 D ✓✓

1.4 C ✓✓ 1.5 A✓✓ 1.6 C✓✓

1.7 C✓✓ 1.8 A✓✓ 1.9 A ✓✓

1.10 D ✓✓

[20]

QUESTION 2/*VRAAG 2*

2.1.1 0,0006 OR/*OF* 6 x 10^{-4} (km) ✓✓ (2)

2.1.2 0,75 (minutes/*minute*) ✓✓ (2)

2.1.3 $T_{(°C)} = (T_{(°F)} - 32) \times 5/9$
16 ✓ = $(T_{(°F)} - 32) \times 5/9$
$T_{(°F)}$ = 60,8 (^{0} F) ✓
(2)

2.2 $\frac{6 \times 10^9}{4 \times 10^4} = \frac{6}{4} \times \frac{10^9}{10^4}$
$= 1{,}5 \times 10^5$✓
$= 150\,000$ ✓
(2)

2.3 12 ✓ (1)

[9]

QUESTION 3/*VRAAG 3*

3.1 Distance is an actual path length between two points.(✓✓)
Afstand is die fisiese padlengte tussen twee punte. (2)

3.2.1 Total distance / *Totale afstand* = 3(400) + 800 + 3(400) ✓= 3 200 m ✓
OR/OF 3,2 km (2)

3.2.2 Displacement / *Verplasing* = 1 600 m ✓ east/*oos* ✓ (2)

3.3.1 **POSITIVE MARKING FROM 3.2.1./*POSITIEWE NASIEN VANAF 3.2.1.***

$Average\ speed = \frac{total\ distance}{total\ time}$✓ / $Gemiddelde\ spoed = \frac{totale\ afstand}{totale\ tyd}$
$= \frac{3\,200}{15 \times 60}$✓
= 3,56 m·s^{-1}✓ (3)

3.3.2 **POSITIVE MARKING FROM 3.2.2./*POSITIEWE NASIEN VANAF 3.2.2.***

$$Avg.Velocity = \frac{total\ displacement}{total\ time} \checkmark = \frac{1600}{15 \times 60} \checkmark\checkmark$$
$$= 1{,}78\ \text{m} \cdot \text{s}^{-1}$$
$$= 1{,}78\ \text{m} \cdot \text{s}^{-1}\ \text{to the west/ na wes} \checkmark$$

$$snelheid = \frac{verplasing}{tyd}$$

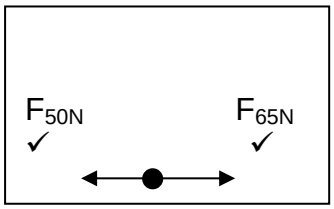
(4)

3.4.1 No ✓/ *Nee* (1)

3.4.2 **NEGATIVE MARKING FROM 3.4.1./*NEGATIEWE NASIEN VANAF 3.4.1.***

Although both vectors have the same magnitude, <u>they are in opposite direction</u>. ✓✓ */ Alhoewel beide vektore dieselfde grootte het, <u>is hulle in teenoorgestelde rigting</u>.* (2)

3.5.1



CRITERIA/*KRITERIA*
ONE mark per arrow and correct label for each force *EEN punt per pyl en korrekte byskrif vir elke krag.*
Comparative lengths of the forces are not required. *Vergelykende lengte van kragte word nie vereis nie.*
Any extra forces: -1 max *Enige ekstra kragte: -1 maks*

ACCEPTABLE LABELS/*AANVAARBARE BYSKRIFTE*	
F_{50N}	Force of Peter on box/F_{Peter}/Applied force *Krag van Peter op boks/F_{Peter}/Toegepaste krag*
F_{65N}	Force of Joe on box/F_{Joe}/Applied force *Krag van Joe op boks/F_{Joe}/Toegepaste krag*

(2)

3.5.2

OPTION 1/*OPSIE 1*	**OPTION 2/*OPSIE 2***
Left: +/ *Links:* + R = F_1 + F_2 = 50 + (-65) ✓ = -15 N ∴ R = 15N *toward/na Joe* ✓	Left: - / Links*:* - R = F_1 + F_2 = -50 + 65 ✓ = 15 N ∴ R = 15N *toward/na Joe* ✓

(2)
[20]

QUESTION 4/*VRAAG 4*

4.1.1 Torque is defined as the turning effect✓ of a force about a point.✓
OR
Torque is the product of a force and the perpendicular distance✓
from the point to the line of action of the force. ✓

Draaimoment word gedefinieer as die draai-effek✓van 'n krag om 'n punt. ✓
OF
Draaimoment is die produk van 'n krag en die loodregte afstand✓ vanaf die punt na die aanwendingslyn van die krag. ✓ (2)

4.1.2

$\tau = Fd_{\perp}$ ✓
$= (500 \times 9{,}8)$ ✓ $\times 15$ ✓
$= 73\,500$ N·m
$\tau = 73500$ N·m; clockwise/*kloksgewys*✓ (4)

4.1.3 No OR moment does not depend on height.✓
NEGATIVE MARKING
Moment only depends on the force/weight of the mass and the distance from the fulcrum ✓

Nee OF moment hang nie af van die hoogte nie.
NEGATIEWE NASIEN
Die moment van 'n krag hang slegs af van die krag/gewig van die massa en die afstand vanaf die draaipunt. (2)

4.2.1 For a body in equilibrium, the sum of the clockwise moments about a point ✓ is equal to the sum of the anticlockwise moments about the same point.✓

Vir 'n liggaam in ewewig is die som van die kloksgewyse momente om 'n punt✓gelyk aan die som van die antikloksgewyse momente om dieselfde punt.✓ (2)

4.2.2

At P: $\sum \tau = \sum \tau$ ✓
$7500 \times 2{,}5$ ✓ $= R_Q\, 6$ ✓
$R_Q = 3\,125$ N.m ✓

At Q: $\sum \tau = \sum \tau$ OR/*OF*
$R_P\, 6$ ✓ $= 7500 \times 3{,}5$ ✓
$R_P = 4\,375$ N.m ✓

$F_{net} = 0$
$R_p + 3\,125$ ✓ $= 7\,500$ ✓
$R_p = 4\,375$ N ✓ (7)

4.3.1 $F_{load/\ las}$ = mg ✓

= 120 x 9,8 ✓
= 1 179 N ✓

(3)

4.3.2 **POSITIVE MARKING FROM 4.3.1. / POSITIEWE NASIEN VANAF 4.3.1.**

$MA = \frac{Load}{Effort}$ ✓ $= \frac{1179}{300}$ ✓ $= 3{,}92$ ✓

$MV = \frac{Las}{Krag}$

(3)
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QUESTION 5/ *VRAAG 5*

5.1 Kinetic energy is the energy of an object due to its motion. (✓✓)
Kinetiese energie is die energie van 'n voorwerp as gevolg van sy beweging. (2)

5.2

$E_k = \frac{1}{2}mv^2$ ✓ $= \frac{1}{2}(0{,}16)(45^2)$ ✓ $= 162$ J ✓

(3)

5.3 $E_k = 1{,}62 \times 10^2$ (J) ✓ (1)

5.4 **POSITIVE MARKING FROM 5.2./*POSITIEWE NASIEN VANAF 5.2.***

E_p = mgh ✓
162= (0,16)(9,8)h ✓
h = 103,32 m ✓

(3)
[9]

QUESTION 6/ *VRAAG 6*

6.1 The net charge of an isolated system remains constant. (✓✓)
Die netto lading van 'n geïsoleerde sisteem bly konstant. (2)

6.2 $Q_f = \frac{Q_X + Q_Y}{2}$ ✓
$= \frac{-4{,}3+1.7}{2}$ ✓
$= -1{,}3 \times 10^{-6} C$ ✓

Correct if charges in numerator are expressed in coulomb.
Korrek indien ladings in teller in coulomb uitgedruk word.

(3)

6.3 $n_e = \frac{Q_f - Q_i}{Q_e}$ ✓
$= \frac{-1{,}3\times10^{-6} - 1{,}7\times10^{-6}}{-1{,}6\times10^{-19}}$ ✓
$= 1{,}875 \times 10^{13}$ ✓

$n_e = \frac{Q_f - Q_i}{Q_e}$ ✓
$= \frac{-1{,}3\times10^{-6} - (-4{,}3\times10^{-6})}{1{,}6\times10^{-19}}$ ✓
$= 1{,}875 \times 10^{13}$ ✓

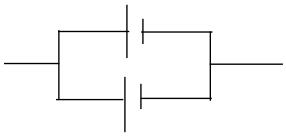
(4)
[9]

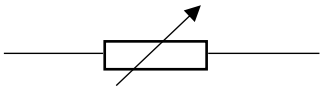
QUESTION 7/*VRAAG 7*

7.1 Any three /*Enige drie* (✓✓✓)

Series / Serie		Parallel
Only one path for current. *Net een pad vir stroom.*	Or/ *Of*	More than one path for current. *Meer as een pad vir stroom*.
Current is the same through all components. *Stroom is dieselfde deur al die komponente.*	Or/ *Of*	Total current is divided between components. *Totale stroom word verdeel tussen komponente*.
Potential difference is divided between components. *Potensiaalverskil word verdeel tussen komponente.*	Or/ *Of*	Potential difference is the same across all components. *Potensiaalverskil is dieselfde oor al die komponente*.
The more resistors in series, the higher the total resistance. *Hoe meer resistor in serie, hoe hoër die totale weerstand.*	Or/ *Of*	The more resistors in parallel, the lower the effective resistance. *Hoe meer resistors in parallel, hoe laer die effektiewe weerstand*.

(3)

7.2.1  A cell correct ✓Combined correctly ✓
'n Sel korrek, korrek gekombineer (2)

7.2.2  ✓ (1)

7.3 To <u>measure the potential difference</u> ✓ <u>across a component</u> in a circuit. ✓
Om die potensiaalverskil oor 'n komponent in 'n stroombaan te meet. (2)

7.4.1 Parallel ✓ (1)

7.4.2 Series/*Serie* ✓ (1)

7.5.1 The three resistors should be combined <u>in parallel</u>. ✓
Die drie weerstande moet <u>in parallel</u> geskakel word. (1)

7.5.2 The current will be the <u>maximum current</u> possible. ✓
Die stroom is die <u>maksimum</u> moontlik<u>e stroom</u>. (1)

[12]

QUESTION 8/*VRAAG 8*

8.1 The rate of flow of charge. (✓✓) / *Die tempo van vloei van lading.* (2)

8.2 The opposition to the flow of an electric current/charges. (✓✓)
Die weerstand teen die vloei van 'n elektriese stroom / ladings. (2)

8.3
$$\frac{1}{R_p} = \frac{1}{R_A} + \frac{1}{R_B} \checkmark$$
$$= \frac{1}{2} + \frac{1}{2} \checkmark$$
$$R_p = 1\Omega$$

$$R_t = R_s + R_p$$
$$= 3 + 1 \checkmark$$
$$= 4\Omega \checkmark$$
(4)

8.4 **POSITIVE MARKING FROM 8.3./*POSITIEWE NASIEN VANAF 8.3.***

$R = \frac{V}{I}$ ✓

$4 = \frac{6}{I}$ ✓

$I = 1{,}5\ A$ ✓ (3)

[11]

QUESTION 9/*VRAAG 9*

9.1.1 Sulphur ✓ / *Swawel* (1)

9.1.2 Argon ✓ (1)

9.1.3 Silicon ✓ / *Silikon* (1)

9.2.1 Iodine (crystals) ✓ / *Jodium(kristalle)* (1)

9.2.2 Nickel (paper clip) ✓ / *Nikkel (skuifspeld)* (1)

9.2.3 Plastic (pen) ✓ / *Plastiek(pen)*
Accept iodine/*Aanvaar jodium* (1)

[6]

QUESTION 10/*VRAAG 10*

10.1.1 10 ✓ (1)

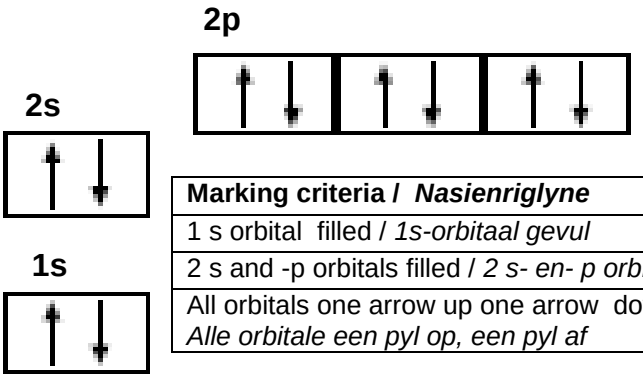
10.1.2 11 ✓ (1)

10.1.3 12 ✓ (1)

10.2 Ion/Ioon ✓
NEGATIVE MARKING
It has a shortage of one electron (or similar answer). ✓
Dit het 'n tekort aan een elektron (of soortgelyke antwoord). (2)

10.3 3 ✓ (1)

10.4



Marking criteria / *Nasienriglyne*	
1 s orbital filled / *1s-orbitaal gevul*	✓
2 s and -p orbitals filled / *2 s- en- p orbitale gevul*	✓
All orbitals one arrow up one arrow down *Alle orbitale een pyl op, een pyl af*	✓

(3)
[9]

QUESTION 11/*VRAAG 11*

11.1 A pure substance consisting of two or more different elements. ✓✓
'n Suiwer stof bestaande uit twee of meer verskillende elemente. (2)

11.2.1 $FeSO_4$ ✓✓ (2)

11.2.2 NaCℓ ✓✓ (2)

11.3.1 Calcium ✓ Carbonate ✓ / *Kalsiumkarbonaat* (2)

11.3.2 Hydrogen ✓ Sulfate ✓ / *Waterstofsulfaa*t
OR sulphuric acid *OF* swawelsuur (2)

11.5 $\underline{HC\ell + NaOH}$ ✓ → $\underline{NaC\ell + H_2O}$ ✓ Balancing/*Balansering*✓ (3)
[13]

QUESTION 12/*VRAAG 12*

12.1 Paraffin wax is highly flammable. ✓ / *Paraffienwas is baie vlambaar.* (1)

12.2 70(°C) ✓ (1)

12.3 T = 29 + 273 ✓ = 302 (K) ✓ (2)

12.4 Heat is energy in transfer. ✓
Temperature is how hot or cold a body is ✓

Warmte is energie in oordrag.
Temperatuur is hoe warm of koud 'n liggaam is. (2)

12.5 Thermometer ✓ / *Termometer* (1)

12.6.1 Temperature/*Temperatuur* ✓ (1)

12.6.2 Time/*Tyd* ✓ (1)

[9]

GRAND TOTAL/*GROOTTOTAAL*: 150