



education

Department of
Education
FREE STATE PROVINCE

EXAMINATION / EKSAMEN

GRADE 10 / GRAAD 10

**TECHNICAL SCIENCES
TEGNIJSE WETENSKAPPE**

MEMORANDUM

JUNE 2018 / JUNIE 2018

MARKS: 200 / PUNTE: 200

TIME: 3 HOURS / TYD: 3 UUR

**This memorandum consists of 11 pages.
*Hierdie memorandum bestaan uit 11 bladsye.***

QUESTION 1 / VRAAG 1

- 1.1 D ✓✓
- 1.2 B ✓✓
- 1.3 D ✓✓
- 1.4 B ✓✓
- 1.5 A ✓✓
- 1.6 C ✓✓
- 1.7 A ✓✓
- 1.8 C ✓✓
- 1.9 B ✓✓
- 1.10 B ✓✓

[20]

QUESTION 2 / VRAAG 2

2.1.1 20×10^{-9} (C) ✓ (1)

2.1.2 $(8 \times 10^{-10}) \times (1 \times 10^6)$ ✓ = 8×10^{-4} (mm) ✓ (2)

2.1.3 $75 \div (60 \times 60)$ ✓ = 0,02 (h) ✓ (2)

2.1.4
$$\begin{aligned} T_{(^{\circ}\text{C})} &= (T_{(^{\circ}\text{F})} - 32) \times 5/9 \\ 32 \text{ } \checkmark &= (T_{(^{\circ}\text{F})} - 32) \times 5/9 \\ T_{(^{\circ}\text{F})} &= 89,6 \text{ } (^{\circ}\text{F}) \checkmark \end{aligned}$$
 (2)

2.2
$$\begin{aligned} \frac{15 \times 10^3}{3 \times 10^8} &= \frac{15}{3} \times \frac{10^3}{10^8} \\ &= 5 \checkmark \times \frac{1}{10^5} \checkmark \\ &= 5 \times 10^{-5} \\ &= 0,00005 \checkmark \end{aligned}$$
 (3)
[10]

QUESTION 3 / VRAAG 3

3.1 **OPTION 1 / OPSIE 1:** $V = (\ell \times b \times h)$ ✓
 $V = (\ell \times b \times h) - 2(\ell \times b \times h)$
 $= (39 \times 15 \times 18)$ ✓ - $2 \checkmark (14 \times 10 \times 18)$ ✓ (✓ subtract/aftrek)
 $= 5\,490 \text{ cm}^3$ ✓

OPTION 2 / OPSIE 2:

$$\begin{aligned} V_1 &= (\ell \times b \times h) \checkmark \\ &= (39 \times 15 \times 18) \checkmark \\ &= 10\,530 \text{ cm}^3 \end{aligned}$$

$$\begin{aligned} V_2 &= 2 \checkmark (14 \times 10 \times 18) \checkmark \\ &= 5\,040 \text{ cm}^3 \end{aligned}$$

$$\begin{aligned} V &= 10\,530 - 5\,040 \checkmark \\ &= 5\,490 \text{ cm}^3 \checkmark \end{aligned}$$

(6)

3.2 **POSITIVE MARKING FROM 3.1 / POSITIEWE NASIEN VANAF 3.1**

$$5\,490 \div (1 \times 10^6) \checkmark = 0,00549 \text{ m}^3 \text{ OR/OF } = 5,49 \times 10^{-3} \text{ m}^3 \checkmark \quad (2)$$

3.3 **POSITIVE MARKING FROM 3.2 / POSITIEWE NASIEN VANAF 3.2**

$$\begin{aligned} m &= 5,49 \times 10^{-3} \checkmark \times 2\,400 \checkmark \\ &= 13,18 \text{ kg} \checkmark \quad (13,176 \text{ kg}) \end{aligned} \quad (3)$$

3.4 **POSITIVE MARKING FROM 3.2 / POSITIEWE NASIEN VANAF 3.2**

OPTION 1 / OPSIE 1:

$$\text{Rate / Tempo} = \frac{\text{Volume}}{\text{time/tyd}} \checkmark$$

$$1,25 \times 10^{-6} \checkmark = \frac{250 \checkmark (5,49 \times 10^{-3})}{\text{time/tyd}} \checkmark$$

$$\text{time/tyd}_{250} = 1\,098\,000 \text{ s OR/OF } 1,098 \times 10^6 \text{ s}$$

$$1,098 \times 10^6 \div (60 \times 60) \checkmark = 305 \text{ h} \checkmark$$

OPTION 2 / OPSIE 2:

$$\text{Rate / Tempo} = \frac{\text{Volume}}{\text{time/tyd}} \checkmark$$

$$1,25 \times 10^{-6} \checkmark = \frac{(5,49 \times 10^{-3})}{\text{time/tyd}} \checkmark$$

$$\text{time/tyd}_1 = 4\,392 \text{ s}$$

$$\text{time/tyd}_{250} = 4\,392 \times 250 \checkmark$$

$$= 1\,098\,000 \text{ s OR/OF } 1,098 \times 10^6 \text{ s}$$

$$1,098 \times 10^6 \div (60 \times 60) \checkmark = 305 \text{ h} \checkmark$$

(6)

3.5

$$\begin{aligned} \text{Speed/spoed} &= 2\pi r(\text{rps}) \checkmark \\ &= \underline{2\pi(0,35)} \times \underline{(2/60)} \checkmark \\ &= 0,07 \text{ m}\cdot\text{s}^{-1} \checkmark \end{aligned}$$

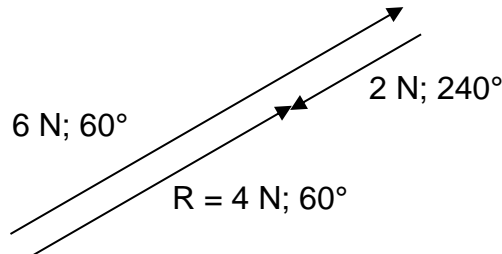
(4)
[21]

QUESTION 4 / VRAAG 4

4.1.1 A single force with the same effect as all the other forces together. (✓✓)
'n Enkele krag met dieselfde uitwerking as al die ander kragte tesame. (2)

4.1.2 240° ✓ (1)

4.1.3



Marking criteria / Nasienriglyne	Mark Punt
Correct measurements of the two vectors (6 cm & 2 cm) <i>Korrekte afmetings van die twee vektore (6 cm & 2 cm)</i>	✓
All three forces have correct labels with magnitudes and directions. <i>All drie kragte het korrekte byskrifte met grootte en rigting.</i>	✓
Construction is done correctly (tail-to-head). <i>Konstruksie is korrek gedoen (stert-by-kop).</i>	✓
Correct final answer <i>Korrekte finale antwoord</i>	✓

(4)

4.2.1 Vector ✓



Force has magnitude and direction (✓✓)

(3)



Vektor ✓

Krag het grootte en rigting. (✓✓)

4.2.2

$$R = F_1 + F_2 + F_3 \checkmark$$

$$-70 \checkmark = 100 + (-120) + F_3 \checkmark$$

$$F_3 = -50\text{ N} \checkmark$$

Positive marking from answer to interpretation
Positiewe nasien vanaf antwoord na interpretasie

Interpretation/Interpretasie: 50 N ✓; left/links ✓

(6)
[16]

QUESTION 5 / VRAAG 5

5.1 Malleable / *Pletbaar en smeebaar* (✓✓) (2)

5.2 Density / *Digtheid* (✓✓) (2)

5.3 Melting point / *Smeltpunt* (✓✓) (2)

5.4 Thermal isolator / *Termiese isolator* (✓✓) (2)

5.2 Brittle / *Bros* (✓✓) (2)

[10]

QUESTION 6 / VRAAG 6

6.1.1 Protons / *Protone* ✓ (1)

6.1.2 12 ✓ (1)

6.1.3 Orbitals / *Orbitale* ✓ (1)

6.1.4 Protons ✓ and neutrons ✓ / *Protone en neutrone* (2)

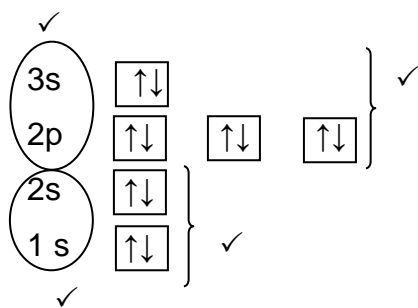
6.1.5 Nucleus / *Kern* ✓ (1)

6.1.6 10 ✓ (1)

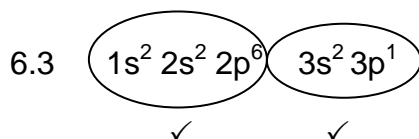
6.1.7 1 ✓ (1)

6.1.8 Valence ✓ electrons ✓ / *Valenselektrone* (2)

6.2



(4)



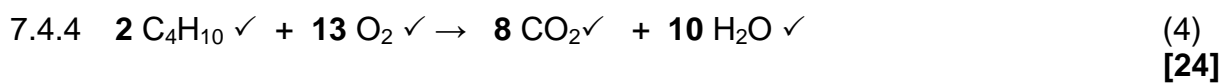
(2)

6.4.1 Earth alkaline metals / *Aard-alkalimetale* ✓ (1)

6.4.2 2 ✓ (1)

- 6.4.3 Cl ✓ (1)
- 6.4.4 Hydrogen / Waterstof ✓ (1)
- 6.4.5 Bromine / Broom ✓ (1)
- [21]

QUESTION 7 / VRAAG 7



QUESTION 8 / VRAAG 8

8.1.1 Electroscope / Elektroskoop ✓ (1)

8.1.2 Electrons are transferred from glass ✓ (to silk cloth).
The glass has a shortage of electrons/excess of protons. ✓
Elektrone word oorgedra vanaf glas (na sy). ✓
Die glas het dan 'n tekort aan elektrone/oormaat protone. ✓ (2)

8.1.3 Negative ✓; same magnitude ✓
Negatief ✓; dieselfde grootte ✓ (2)

8.1.3 Glass is positive; silk negative (✓✓) OR They have opposite charges.
OR Magnitudes of charges are the same. Glas is positief; sy negatief (✓✓)
OR Hulle het teenoorgestelde ladings.
OR Grootte van lading op beide is dieselfde. (2)

8.1.4 Positive / Positief ✓ (1)

8.2.1 The net charge ✓ of an isolated system remains constant ✓ during any physical process.
Die netto lading ✓ van 'n geïsoleerde sisteem bly konstant ✓ tydens enige fisiese proses. (2)

8.2.2 Y to X / Y na X ✓ (1)

8.2.3

<u>OPTION 1 / OPSIE 1</u>	<u>OPTION 2 / OPSIE 2</u>
$Q = \frac{Q_1 + Q_2}{2} \checkmark$ $= \frac{-2 \times 10^{-6} + (-8 \times 10^{-6})}{2} \checkmark$ $= -5 \times 10^{-6} \text{ C } \checkmark$	$Q = \frac{Q_1 + Q_2}{2} \checkmark$ $= \frac{-2 + (-8)}{2} \checkmark$ $= -5 \mu\text{C} = -5 \times 10^{-6} \text{ C } \checkmark$

(4)

8.2.4 POSITIVE MARKING FROM 8.2.3 / POSITIEWE NASIEN VANAF 8.2.3

<u>OPTION 1 / OPSIE 1</u>	<u>OPTION 2 / OPSIE 2</u>
$n = \frac{Q}{q} \checkmark$ $= \frac{-5 \times 10^{-6} - (-8 \times 10^{-6})}{1,6 \times 10^{-19}} \checkmark$ $= 1,88 \times 10^{13} \checkmark$	$n = \frac{Q}{q} \checkmark$ $= \frac{-8 \times 10^{-6} - (-5 \times 10^{-6})}{-1,6 \times 10^{-19}} \checkmark$ $= 1,88 \times 10^{13} \checkmark$

Note: If numerator is positive (negative); denominator must be positive (negative) to give positive final answer.

The answer from 8.2.3 can also be used with the $-2 \times 10^{-6} \text{ C}$ charge.

Let wel: As die teller positief (negatief) is moet die noemer positief (negatief) wees om 'n positiewe finale antwoord te gee.
Die antwoord vanaf 8.2.3 kan ook saam met die -2×10^{-6} C-lading gebruik word.

(4)

[17]

QUESTION 9 / VRAAG 9

9.1.1  ✓ (1)

9.1.2 An instrument to measure electric current. ✓
'n Instrument wat stroom meet. (1)

9.1.3  ✓ (1)

9.1.4 Complete the circuit/conduct current/allow charges to flow, etc. ✓
Voltooi die stroombaan/gelei stroom/laat lading vloei, ens. (1)

9.1.5  ✓ (1)

9.1.6 Control the flow of current in a circuit./cut off current, etc. ✓
Beheer die vloei van stroom in 'n stroombaan/onderbreek stroom, etc.. (1)

9.2.1 A ✓ (1)


9.2.2 Same potential difference ✓; more resistors/bulbs in series ✓
Dieselfde potensiaalverskil ✓; meer resistors/gloeilampe in series ✓ (2)

9.2.3 B & E (✓✓) (2)

9.2.4 $V = 1,5 \text{ V} \div 3$ ✓
 $= 0,5 \text{ V}$ ✓ (2)

9.2.5
$$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \quad \checkmark$$
$$= \frac{1}{1} + \frac{1}{1} + \frac{1}{1} \quad \checkmark$$
$$R_p = 0,33 \, \Omega \quad \checkmark$$
 (3)

9.2.6
$$V = I \times R \quad \checkmark$$
$$1,5 \checkmark = I \times (1 + 1) \quad \checkmark$$
$$I = 0,75 \text{ A} \quad \checkmark$$
 (4)
[20]

QUESTION 10 / VRAAG 10


10.1 Resistance / Weerstand ✓ (1)

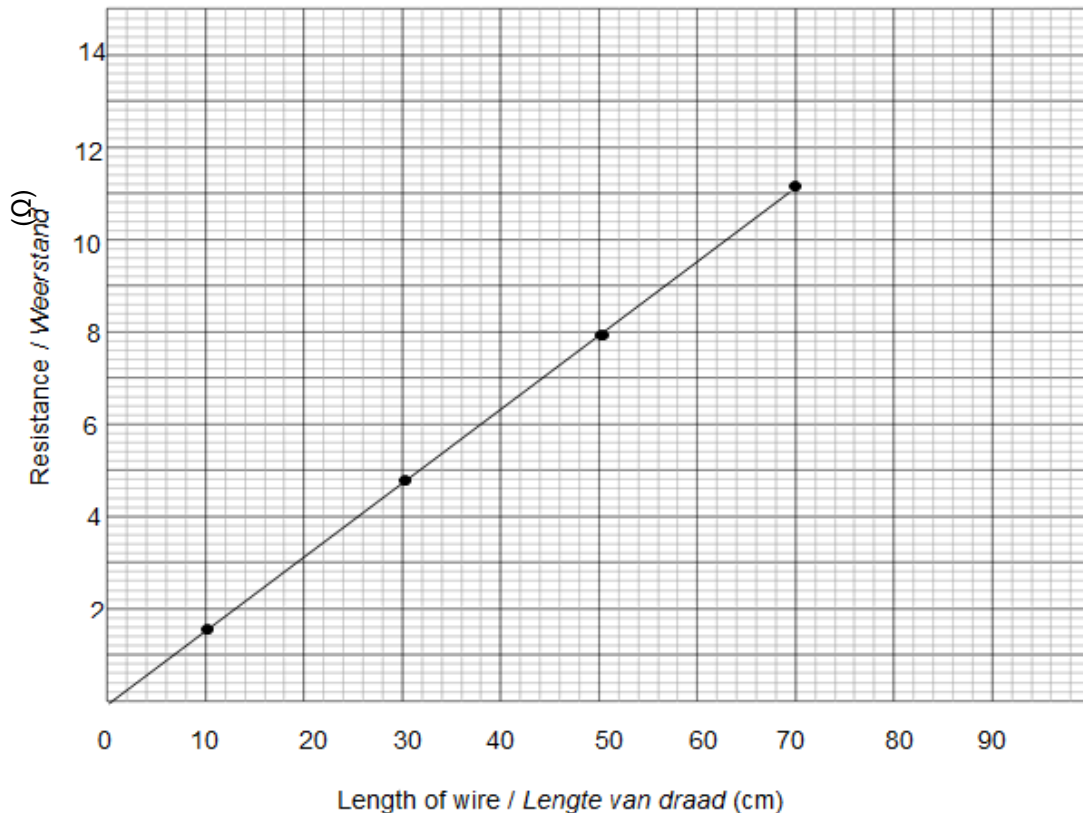
10.2 Temperature of wire / Temperatuur van draad ✓

Width of wire / Dikte van draad

Note: Type of wire is not acceptable; it is given in the question.

LW: Soort draad is nie aanvaarbaar nie; dit is in die vraag gegee. (2)

10.3  Resistance vs length of wire / Weerstand teenoor lengte van draad



Marking criteria / Nasienriglyne	Mark Punt
Appropriate heading / Geskikte opskrif	✓
Label on y-axis (resistance and unit); label on x-axis (length and unit) Byskrif vir y-as (weerstand en eenheid); byskrif vir x-as (lengte en eenheid)	✓
Appropriate scale is used. / Geskikte skaal is gebruik.	✓
Two points plotted correctly. / Twee punte korrek gestip.	✓
Twee other points plotted correctly. / Twee ander punte korrek gestip.	✓
Best-fit line drawn. / Bes-passende lyn getrek.	✓

(6)

10.4 81,25 (cm) ✓ (80 - 82) (1)

10.5 Longer wire; higher resistance (✓✓)/Langer draad; groter weerstand (✓✓) (2)

[11]

QUESTION 11 / VRAAG 11

11.1.1 The rate of flow of charges (✓✓) / *Tempo van ladingvloei* (✓✓) (2)

11.1.2

$$I = \frac{Q}{\Delta t} \checkmark$$

$$0.42 \checkmark = \frac{Q}{(2 \times 60 \times 60)} \checkmark$$

$$Q = 3\,024 \text{ C} \checkmark$$

(4)

11.1.3 **POSITIVE MARKING FROM 11.1.2 / POSITIEWE NASIEN VANAF 11.1.2**

$$V = \frac{W}{Q} \checkmark$$

$$240 \checkmark = \frac{W}{3\,024}$$

$$W = 725\,760 \text{ J} \checkmark$$

(3)

11.2.1 Emf of the cell / *Emk van die sel* ✓

Potential difference across the cell ✓ when there is no current in the circuit. ✓

Potensiaalverskil oor die sel ✓ wanneer daar geen stroom in die stroombaan is nie. ✓ (3)

11.2.2

$$V_T = V_1 + V_2$$

$$20 = V_1 + 12,5 \checkmark$$

$$V_1 = 7,5 \text{ V} \checkmark$$

(2)

11.2.3 **OPTION 1 / OPSIE 1**

$$V_T = I_T \times R_T \checkmark$$

$$20 = 4 \times R_T \checkmark$$

$$R_T = 5 \, \Omega \checkmark$$

OPTION 2 / OPSIE 2

$$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} \checkmark$$

$$= \frac{1}{5} \checkmark + \frac{1}{3} \checkmark$$


$$R_p = 1,875 \, \Omega$$

$$R_T = R_s + R_p = 3,125 + 1,875$$

$$= 5 \, \Omega \checkmark$$

(3)

11.2.4 Smaller than / *Kleiner as* ✓

 V the same / *V dieselfde* ✓ / $R_2 > R_3$ ✓ (3)

11.2.5 Clockwise / *Kloksgewys* ✓ (1)

11.2.6 Decrease / <i>Verminder</i> (✓✓)	(2)
11.2.7 Decrease / <i>Verminder</i> (✓✓)	(2)
11.2.8 Increase / <i>Vermeerder</i> (✓✓)	(2)
11.2.9 Same / <i>Dieselfde</i> (✓✓)	(2)
	[29]

GRAND TOTAL / GROOTTOTAAL: 200