



education

Department of
Education
FREE STATE PROVINCE

EXAMINATION / EKSAMEN

GRADE 10 / GRAAD 10

**TECHNICAL SCIENCES
TEGNIJSE WETENSKAPPE**

MEMORANDUM

NOVEMBER 2018

MARKS: 200 / PUNTE: 200

TIME: 3 HOURS / TYD: 3 UUR

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

QUESTION 1/VRAAG 1

- | | | | | | | |
|------|------|------|------|------|------|-------------|
| 1.1 | B ✓✓ | 1.2 | B ✓✓ | 1.3 | D ✓✓ | |
| 1.4 | A ✓✓ | 1.5 | D ✓✓ | 1.6 | D ✓✓ | |
| 1.7 | A ✓✓ | 1.8 | B ✓✓ | 1.9 | B ✓✓ | |
| 1.10 | C ✓✓ | 1.11 | C ✓✓ | 1.12 | A ✓✓ | |
| 1.13 | A ✓✓ | 1.14 | C ✓✓ | 1.15 | C ✓✓ | [30] |

QUESTION 2/VRAAG 2

2.1 m/metre/meter ✓ (1)

2.2 2,5 m = 2,5 x 1000 ✓ (mm) = 2500 mm ✓ (2)

2.3.1 Area = l x b ✓
= 2,5 x 3,24 ✓
= 8,1 m² ✓ (3)

2.3.2 Area = l x b
= 0,3 x 0,3 ✓
= 0,09 m² ✓ (2)

2.3.3 **POSITIVE MARKING FROM 2.3.1 AND 2.3.2.**
POSITIEWE NASIEN VANAF 2.3.1 EN 2.3.2.

no of tiles / aantal teëls = $\frac{8,1}{0,09}$ ✓
= 90 ✓ (3)

2.3.4 **POSITIVE MARKING FROM 2.3.3. / POSITIEWE NASIEN VANAF 2.3.3.**

no of boxes / aantal bokse = $\frac{90}{18}$ ✓
= 5 ✓ (3)
[14]

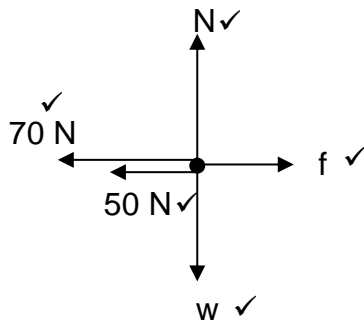
QUESTION 3/VRAAG 3

3.1.1 $w = mg \checkmark = (80)(9,8) \checkmark = 784 \text{ N} \checkmark$ (3)

3.1.2 The table exerts an equal force (to the weight) on the box \checkmark (normal force), but in the opposite direction. \checkmark

Die tafel oefen 'n gelyke krag (aan die gewig) op die boks uit \checkmark (normaalkrag), maar in die teenoorgestelde rigting. \checkmark (2)

3.2.1



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

ACCEPTABLE LABELS/AANVAARBARE BYSKRIFTE	
w	F_g /weight/gravity/force of gravity/gravitational force F_g /gewig/gravitasie/gravitasiekrag
70 N	Force of Jimmy on box/ F_{Jimmy} /Applied force/ F_{App} <i>Krag van Jimmy op boks/F_{Jimmy}/Toegepaste krag/F_{Toe}</i>
50 N	Force of Thabo on box/ F_{Thabo} /Applied force/ F_{App} <i>Krag van Thabo op boks/F_{Thabo}/Toegepaste krag/F_{Toe}</i>
f	F_f /force of friction/friction F_f /wrywingskrag/wrywing
N	F_N /normal force/force of surface on box F_N /normaalkrag/krag van oppervlak op boks

(5)

3.2.2

OPTION 1/OPSIE 1

Left: + / Links: +
 $R = F_1 + F_2 \checkmark$
 $= 70 + 50 \checkmark = 120 \text{ N} \checkmark$
 $\therefore R = 120 \text{ N left/links} \checkmark$

OPTION 2/OPSIE 2

Left: - / Links: -
 $R = F_1 + F_2 \checkmark$
 $= -70 + (-50) \checkmark = -120 \text{ N} \checkmark$
 $\therefore R = 120 \text{ N left/links} \checkmark$

(4)

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

120 N \checkmark right/regs \checkmark (2)

3.2.4 Equilibrant/*Ekwilibrant* \checkmark (1)
[17]

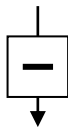
QUESTION 4/VRAAG 4

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

- 4.2 $Q_Y = \frac{Q_X + Q_Y}{2} \checkmark$
 $= \frac{4,3 + 2,1}{2} \checkmark$
 $= 3,2 \times 10^{-9} \text{ C} \checkmark$ (3)

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

- 4.3 Y to/na X (✓✓) **One of or similar ✓**
Y has less positives/more negatives
X has more positives/less negatives
Electrons move from more negative to less negative
Een van of soortgelyk
Y het minder positiewes/meer negatiewes.
X het meer positiewes/minder negatiewes.
Elektrone beweeg van meer negatief na minder negatief. (3)



- 4.4 $n_e = \frac{Q_f - Q_i}{Q_e} \checkmark$
 $= \frac{3,2 \times 10^{-9} - 2,1 \times 10^{-9}}{+1,6 \times 10^{-19}} \checkmark$
 $= 6,88 \times 10^9 \checkmark$ (4)
- $n_e = \frac{Q_f - Q_i}{Q_e} \checkmark$
 $= \frac{3,2 \times 10^{-9} - 4,3 \times 10^{-9}}{-1,6 \times 10^{-19}} \checkmark$
 $= 6,88 \times 10^9 \checkmark$ [12]

QUESTION 5/VRAAG 5

- 5.1.1 The rate of flow of charge. (✓✓) Die tempo van ladingvloei. (✓✓) (2)

- 5.1.2 $I = \frac{Q}{\Delta t} \checkmark = \frac{10}{5} \checkmark = 2 \text{ A} \checkmark$ (3)

- 5.1.3 Amount of work done per unit charge. (✓✓)
Hoeveelheid arbeid verrig per eenheidslading. (2)

- 5.1.4 $V = \frac{W}{Q} \checkmark = \frac{120}{10} \checkmark = 12 \text{ V} \checkmark$ (3)

- 5.2.1 The potential difference across the battery/cell(s) ✓ when there is no current in the circuit. ✓

Die potensiaalverskil oor die battery/sel(le) ✓ wanneer daar geen stroom in die stroombaan is nie. ✓ (2)

- 5.2.2
- | OPTION 1/OPSIE 1 | OPTION 2/OPSIE 2 |
|---|---|
| $\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} \checkmark$
$\frac{1}{R_p} = \frac{1}{6} \checkmark + \frac{1}{3} \checkmark$
$\therefore R_p = 2 \Omega \checkmark$ | $R_p = \frac{R_1 \times R_2}{R_1 + R_2} \checkmark$
$R_p = \frac{6 \times 3}{6 + 3} \checkmark$
$= 2 \Omega \checkmark$ |
- (4)

5.2.3 POSITIVE MARKING FROM 5.2.2. / POSITIEWE NASIEN VANAF 5.2.2.

$$R_T = R_p + R_2 \checkmark = 2 + 2 \checkmark = 4 \Omega \checkmark \quad (3)$$

5.2.4 POSITIVE MARKING FROM 5.2.3. / POSITIEWE NASIEN VANAF 5.2.3.

$$I = \frac{V}{R} \checkmark = \frac{12}{4} \checkmark = 3 A \checkmark \quad (3)$$

$$5.2.5 \quad R_T = R_1 + R_2 = \underline{2 + 3} \checkmark = 5 \Omega \checkmark \quad (2)$$

5.2.6 POSITIVE MARKING FROM 5.2.5. / POSITIEWE NASIEN VANAF 5.2.5.

$$I = \frac{V}{R} = \frac{12}{5} \checkmark = 2,4 A \checkmark \quad (2)$$

[26]

QUESTION 6/VRAAG 6

6.1.1 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)

6.1.2

$$\tau = Fd_{\perp} \checkmark$$

$$= 40 \times 0,75 \checkmark$$

$$= 30 \text{ N}\cdot\text{m} \checkmark$$

$$\tau = 30 \text{ N}\cdot\text{m}; \text{ anticlockwise/antikloksgewys } \checkmark$$

(4)

6.2.1 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)

6.2.2

$$\begin{aligned}\tau &= \Sigma Fd \\ &= (40)(1,5) \checkmark + (20)(2) \checkmark \\ &= 100 \text{ N} \cdot \text{m} \checkmark\end{aligned}$$

(3)

6.2.3 **POSITIVE MARKING FROM 6.2.2. / POSITIEWE NASIEN VANAF 6.2.2.**

$$\begin{aligned}\Sigma \tau &= \Sigma \tau \checkmark \\ 100 &= 4F_X \checkmark \\ F_X &= 25 \text{ N} \checkmark\end{aligned}$$

(3)

6.2.4 **POSITIVE MARKING FROM 6.2.3. / POSITIEWE NASIEN VANAF 6.2.3.**

$$F = 25 + (40 + 20) \checkmark = 85 \text{ N} \checkmark$$

(2)

6.3

$$MA = \frac{\text{Load}}{\text{Effort}} \checkmark = \frac{60}{20} \checkmark = 3 \checkmark$$

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

(3)

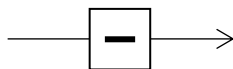
[19]

QUESTION 7/VRAAG 7

7.1 Distance is the (actual) path length ✓ between two points. ✓
Displacement is the shortest path between two points ✓ in a particular direction. ✓

Afstand is die (werklike) padlengte ✓ tussen twee punte. ✓
Verplasing is die kortste pad tussen twee punte ✓ in 'n sekere rigting. ✓ (4)

7.2 Zero/Nul (0) (✓✓)



Move at constant velocity (speed). /
No change in velocity (speed). ✓
Beweeg teen konstante snelheid (spoed). /
Geen verandering in snelheid. (3)

$$\begin{aligned}7.3 \quad \text{speed} &= \frac{\text{distance}}{\text{time}} \checkmark \\ 120 \checkmark &= \frac{10}{\text{time}} \checkmark \\ t &= 0,083 \text{ h} \checkmark\end{aligned}$$

$$\text{spoed} = \frac{\text{afstand}}{\text{tyd}}$$

(4)

$$7.4 \quad 120 \text{ km} \cdot \text{h}^{-1} = 120 \times \frac{1000}{3600} \checkmark = 33,33 \text{ m} \cdot \text{s}^{-1} \checkmark$$

(3)

7.5.1 20 km (✓✓)

(2)

7.5.2 Zero/Nul (0) (✓✓)

(2)


$$7.5.3 \quad \text{acceleration} = \frac{\text{change in velocity}}{\text{time}} \checkmark = \frac{20-0}{7,6} \checkmark = 2,63 \text{ m} \cdot \text{s}^{-2} \checkmark$$

(4)

$$\text{versnelling} = \frac{\text{verandering in snelheid}}{\text{tyd}}$$

[22]

QUESTION 8/VRAAG 8

- 8.1  Gravitational potential energy (✓✓) Gravitatie-potensiële energie (✓✓)
Energy due to its position/height above the floor. ✓ Energie as gevolg van sy posisie/hoogte bo die vloer. ✓ (3)
- 8.2 $E_p/U = mgh$ ✓
 $= (0,8)(9,8)(2)$ ✓
 $= 15,68 \text{ J}$ ✓ (3)
- 8.3.1 Energy of an object due to its motion. (✓✓)
Energie van 'n voorwerp as gevolg van sy beweging. (2)
- 8.3.2 The sum of gravitational potential energy and kinetic energy. (✓✓)
Die som van gravitasie-potensiële energie en kinetiese energie. (2)
- 8.3.3 **POSITIVE MARKING FROM 8.2. / POSITIEWE NASIEN VANAF 8.2.**
- $$\left. \begin{aligned} ME_{Top} &= ME_{Bottom} \\ (E_p + E_k)_{Top} &= (E_p + E_k)_{Bottom} \\ (mgh + \frac{1}{2}mv^2)_{Top} &= (mgh + \frac{1}{2}mv^2)_{Bottom} \\ 15,68 + 0 &= 0 + \frac{1}{2}(0,8)(v)^2 \\ &= 6,26 \text{ m} \cdot \text{s}^{-1} \end{aligned} \right\} \checkmark$$
- (4)
- 8.3.4 **POSITIVE MARKING FROM 8.2. / POSITIEWE NASIEN VANAF 8.2.**
15,68 J (✓✓) (2)
[16]

QUESTION 9/VRAAG 9

- 9.1 The measure of how hot or cold a body is. (✓✓)
Die maatstaf van hoe warm of koud 'n liggaam is. (2)
- 9.2 Any correct TWO/Enige TWEE korrektes ✓✓
Mercury/Kwik
Alcohol/Alkohol
Thermo-electric/Termo-elektries
Digital/Digitaal (2)
- 9.3 Any correct TWO/Enige TWEE korrektes: ✓✓
Measure body temperature./Meet liggaamstemperatuur.
Weather forecasting/Weervoorspelling
Car cooling systems/Motorverkoelingstelsels (2)
- 9.4 $T = 25 + 273$ ✓ = 298 K ✓ (2)
- 9.5 2 ✓ (1)
[9]

QUESTION 10/VRAAG 10

- 10.1.1 F ✓ Accept carbon/C *Aanvaar koolstof/C* (1)
- 10.1.2 A ✓ Accept hydrogen/H *Aanvaar waterstof/H* (1)
- 10.1.3 B ✓ Accept helium/He *Aanvaar helium/H* (1)
- 10.1.4 I ✓ Accepte fluorine/F *Aanvaar fluoor/F* (1)
- 10.2.1 Na ✓ (1)
- 10.2.2 12 ✓ (1)
- 10.2.3 2 ✓ (1)
- 10.2.4 12 ✓ (1)
- 10.2.5 17 ✓ (1)
- 10.3.1 Sodium ✓ sulphide ✓ Natrium ✓ sulfied ✓ (2)
- 10.3.2 Lithium ✓ sulphite ✓ Litium ✓ sulfiet ✓ (2)
- 10.3.3 C or/of K⁺ ✓ (1)
- 10.3.4 G or/of F⁻ ✓ (1)
- 10.3.5 Cu ✓ O ✓ (2)
- 10.4 NaOH + HCl ✓ → NaCl + H₂O ✓ bal ✓

MARKING CRITERIA/NASIENKRITERIA

Reactants correct/Reagense korrek ✓

Products correct/Produkte korrek ✓

Balancing correct/Balansering korrek ✓

If any of first two marks is lost, third mark is forfeited.

As enige van eerste twee punte verloor word, word derde punt verbeur.

(3)

[20]

QUESTION 11/VRAAG 11

11.1.1 Non-magnetic/*Nie-magneties* ✓ (1)

11.1.2 Magnetic/*Magneties* ✓ (1)

11.1.3 Non-magnetic/*Nie-magneties* ✓ (1)

11.2 Any correct two/*Enige twee korrektes* ✓✓
In speakers/*In luidsprekers*
Fridge doors/*Yskasdeure*
Buttons/*Knope*
Screw drivers/*Skroewedraaiers*
Et cetera/*Ensovoorts* (2)

11.3.1 Aluminium✓ & copper/*koper* ✓



High thermal conductivity/*Hoë termiese geleiding* ✓ (3)

11.3.2 Air/*lug* & polyester/*poliëster*✓



Low thermal conductivity/*Lae termiese geleiding* ✓ (3)

11.4.1 Li ✓ (1)

11.4.2 Al ✓ (1)

11.4.3 Si ✓ (1)

11.4.4 Si ✓ (1)

[15]

GRAND TOTAL/GROOTTOTAAL: 200