



**education**

Department of  
Education  
FREE STATE PROVINCE

**EXAMINATION / EKSAMEN**

**GRADE 10 / GRAAD 10**

**TECHNICAL SCIENCES  
TEGNIJSE WETENSKAPPE**

**MEMORANDUM**

**JUNE 2019**

**MARKS: 150 / PUNTE: 150**

**TIME: 3 HOURS / TYD: 3 UUR**

**This memorandum consists of eight pages.  
*Hierdie memorandum bestaan uit agt bladsye.***

### QUESTION 1/VRAAG 1

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

[20]

### QUESTION 2/VRAAG 2

- 2.1
- 2.1.1 hertz ✓ (1)
- 2.1.2  $2,6 \times 10^9$  (Hz)/2 600 000 000 (Hz) ✓ (1)
- 2.1.3  $1,024 \times 10^9$  (bytes/grepe) **OR/OF**  
1 024 000 000 (bytes/grepe) ✓ (1)
- 2.1.4 1,024 (Gbytes / Ggrepe) ✓✓ (2)
- 2.2
- 2.2.1 400 (dm) ✓ (1)
- 2.2.2 0,2 (dm<sup>3</sup>) ✓✓ (2)
- 2.3
- 2.3.1  $3,2 \times 10^4$  (J) ✓ (1)
- 2.3.2  $4,35 \times 10^{-2}$  (A) ✓ (1)

**2.1.2 – 2.3.2**  
Do not penalise if unit is not given.  
*Moenie penaliseer as eenheid nie  
gegee is nie.*

- 2.4 Radius of the sphere/*Radius van die sfeer* =  $\frac{22}{2} = 11$  cm ✓

Surface area/*Oppervlak*<sub>(sphere/sfeer)</sub> =  $4\pi r^2$  ✓  
=  $(4)(3,14)(11^2)$  ✓  
=  $1\,519,76$  cm<sup>2</sup> ✓  
OR/OF =  $0,15$  m<sup>2</sup> (4)

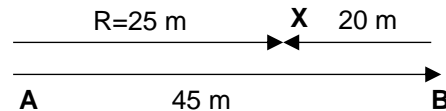
- 2.5
- Density =  $\frac{\text{Mass}}{\text{Volume}}$  ✓ / *Digtheid* =  $\frac{\text{massa}}{\text{Volume}}$   
=  $\frac{8}{10}$  ✓  
=  $0,8$  g·m<sup>-3</sup> ✓ (3)
- [17]

### QUESTION 3/VRAAG 3

3.1 Displacement is the shortest path between two points ✓ in a particular direction. ✓ / Verplasing is die korste pad tussen twee punte in 'n bepaalde rigting. (2)

3.2 Vector ✓ / Vektor  
It has both magnitude and direction. ✓ / Het beide grootte en rigting (2)

3.3



CRITERIA FOR MARKING/NASIENKRITERIA	Mark/Punt
<ul style="list-style-type: none"> <li>Correct scale of 2 cm to 10 m used. <i>Korrekte skaal van 2 cm vir 10 m gebruik.</i></li> </ul>	✓
<ul style="list-style-type: none"> <li>Tail-to-head method correctly used and all vectors have arrowheads. <i>Stert-by-kopmetode korrek gebruik en alle vektore het pylpunte.</i></li> </ul>	✓
<ul style="list-style-type: none"> <li>All three vectors have correct labels with magnitude / <i>Al drie vektore het die korrekte byskrifte met grootte.</i></li> </ul>	✓
<ul style="list-style-type: none"> <li>Correct displacement / <i>Korrekte verplasing</i></li> </ul>	✓

(4)

3.4 Total distance/Totale afstand = 45 m + 20 m = 65 m ✓ (1)

3.5 Rate of change in distance.  
*Tempo van verandering in afstand.* ✓✓ (2)

3.6 **POSITIVE MARKING FROM 3.4. / POSITIEWE NASIEN VANAF 3.4.**

$$\begin{aligned} \text{Speed} &= \frac{\text{distance}}{\text{time}} \checkmark & / \text{Spoed} &= \frac{\text{afstand}}{\text{tyd}} \\ &= \frac{65}{14} \checkmark \\ &= 4,64 \text{ m} \cdot \text{s}^{-1} \checkmark \end{aligned}$$

(4)

3.7 **POSITIVE MARKING FROM 3.3. / POSITIEWE NASIEN VANAF 3.3.**

$$\begin{aligned} v &= \frac{\Delta x}{\Delta t} \checkmark \\ &= \frac{25}{14} \checkmark \\ &= 1,79 \text{ m} \cdot \text{s}^{-1} \checkmark \end{aligned}$$

$$\begin{aligned} \text{velocity} &= \frac{\text{displacement}}{\text{time}} \\ \text{snelheid} &= \frac{\text{verplasing}}{\text{tyd}} \end{aligned}$$

(4)

3.8 Rate of change of velocity.  $\checkmark\checkmark$  / Tempo waarteen snelheid verander.

(2)  
[21]

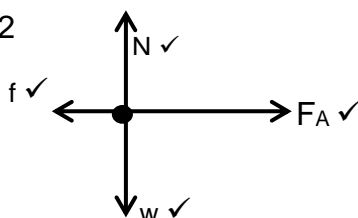
**QUESTION 4/VRAAG 4**

4.1

4.1.1 The force parallel to the surface that opposes the motion of an object  $\checkmark$  and acts in the direction opposite the motion of the object.  $\checkmark$  / Die krag parallel aan die oppervlak wat teen die beweging van die voorwerp inwerk.

(2)

4.1.2



- Do not penalise for length of arrows.  
*Moenie vir die lengte van pyle penaliseer nie.*
- Penalise once if force is not touching the body.  
*Penaliseer een keer as die krag nie aan die liggaam raak nie.*
- Penalise once for extra force(s).  
*Penaliseer een keer vir ekstra krag(te).*
- For force diagram/ Vir kragtediagram (Max  $\frac{3}{4}$ )
- A force cannot be indicated by a line; must be an arrow.  
*Penalise each time./'n Krag kan nie met 'n lyn aangedui word nie; moet 'n pyl wees. Penaliseer elke keer.*

ACCEPTABLE LABELS/AANVAARBARE BYSKRIFTE	
w	$F_g$ /weight/gravity/force of gravity/gravitational force $F_g$ /gewig/gravitasie/gravitasiekrag
$F_A$	Force of Thato on the box/ $F_{\text{Thato}}$ /Applied force/ 20 N <i>Krag van Thato op boks/<math>F_{\text{Thato}}</math>/Toegepaste krag</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

(4)

4.1.3 The force works over a distance ✓ without physically touching the object. ✓  
*Die krag werk oor 'n afstand sonder om fisies aan die liggaam te raak.* (2)

4.1.4 Weight/Gravitational force ✓ Gewig/Gravitasiekrag (1)

4.1.5  $w = mg$  ✓  
 $= 15 \times 9,8$  ✓  
 $= 147 \text{ N}$  ✓ (3)

4.2

4.2.1 Resultant is the single force which can produce the same effect as two or more forces. ✓✓ / *Resultant is die enkele krag met dieselfde effek as die twee of meer kragte saam*  
Equilibrant the force that has the same magnitude as the resultant but acts in the opposite direction. ✓✓ / *Ekwilibrant is die krag met dieselfde grootte as die resultant maar wat in die teenoorgestelde rigting as die resultant inwerk* (4)

4.2.2

<u>Option 1/ Opsie 1:</u> East/Oos : +	<u>Option 2 Opsie 2:</u> East/Oos : -
Resultant = (+8) + (+6) + (-4) ✓ = +10 N = 10 N ✓ East/Oos ✓	Resultant = (-8) + (-6) + (+4) ✓ = -10 N = 10 N ✓ East/Oos ✓

(3)

4.2.3 **POSITIVE MARKING FROM 4.2.2. / POSITIEWE NASIEN VANAF 4.2.2.**  
10 N ✓ West/Wes ✓ (2)

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### QUESTION 5/VRAAG 5

5.1.1 The turning effect of a force ✓ about a fulcrum ✓  
*Die draai-effek (moment) van 'n krag om die steunpunt.* (2)

5.1.2  $\Gamma = F \times d_{\perp}$  ✓  
 $= 700 \times 2$  ✓  
 $= 1400 \text{ N}\cdot\text{m}$  clockwise/kloksgewys ✓ (3)

**POSITIVE MARKING FROM 5.1.2. / POSITIEWE NASIEN VANAF 5.1.2.**

5.1.3  $M_{CW} = M_{AW}$  ✓  
 $1400 \text{ ✓} = 560 \times d_{\perp}$  ✓  
 $d_{\perp} = 2,5 \text{ m}$  ✓ (4)

5.1.4 The law of moments ✓ / Die wet van momente

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 wat in ewewig verkeer sal die som van die kloksgewyse momente om 'n punt gelyk wees aan die som van die anti-kloksgewyse momente om dieselfde punt. (3)

$$\begin{aligned} 5.2 \quad \Gamma &= F \times d_{\perp} \quad \checkmark \\ &= (200) (25 \times 10^{-2}) \quad \checkmark \\ &= 50 \text{ N}\cdot\text{m} \quad \checkmark \end{aligned} \quad \begin{matrix} (3) \\ [15] \end{matrix}$$

**QUESTION 6/VRAAG 6**

6.1

6.1.1 A ✓ (1)

6.1.2 C ✓ (1)

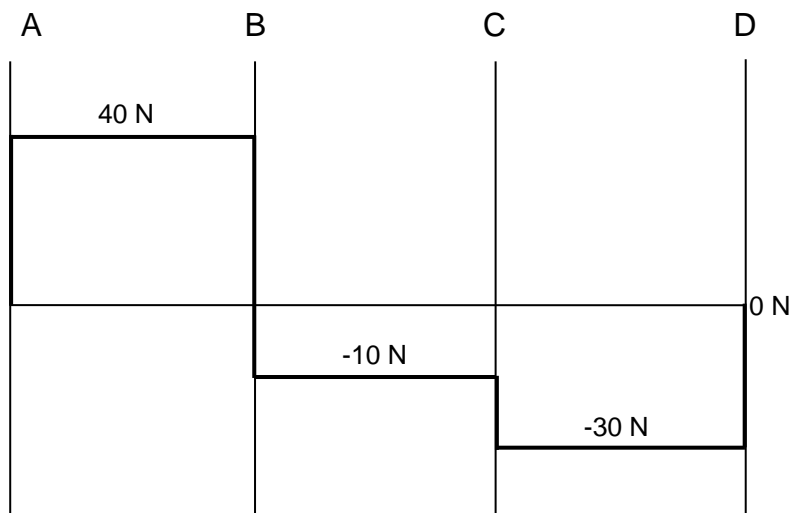
6.1.3 B ✓ (1)

$$\begin{aligned} 6.2 \quad MA &= \frac{\text{Load}}{\text{Effort}} \quad \checkmark / \quad MA = \frac{Las}{Krag} \\ &= \frac{400}{150} \quad \checkmark \\ &= 2,67 \quad \checkmark \end{aligned} \quad (3)$$

$$\begin{aligned} 6.3.1 \quad \Sigma \tau &= \Sigma \tau \quad \checkmark \\ \frac{F_A(0) + 50(2) + 20(4)}{F_B} &= \frac{F_B(6)}{30 \text{ N}} \quad \checkmark \\ \Sigma \tau &= \Sigma \tau \\ \frac{F_A(6)}{F_A} &= \frac{50(4) + 20(2) + 30(0)}{40 \text{ N}} \quad \checkmark \end{aligned}$$

$$\begin{aligned} \text{OR / OF} \\ R &= 0 \\ F_A + 30 &= 50 + 20 \quad \checkmark \\ F_A &= 40 \text{ N} \quad \checkmark \end{aligned} \quad (7)$$

6.3.2



CRITERIA FOR MARKING/NASIENKRITERIA	MARK/PUNT
• Force $F_A$ with horizontal line from <b>A</b> to <b>B</b> (40 N)/ <i>Punt <math>F_A</math> met horisontale lyn van <b>A</b> na <b>B</b> (40 N)</i>	✓
• Force $F_B$ horizontal line from <b>B</b> to <b>C</b> (-10 N)/ <i>Krag <math>F_B</math> horisontale lyn van <b>B</b> na <b>C</b> (-10 N)</i>	✓
• Force $F_C$ with horizontal line from <b>C</b> to <b>D</b> (-30 N)/ <i>Krag <math>F_C</math> met horisontale lyn van <b>C</b> na <b>D</b> (-30 N)</i>	✓
• Correct shape/ <i>Korrekte vorm</i>	✓

(4)  
[17]

### QUESTION 7/VRAAG 7

7.1 Energy an object has because to its position/height above the surface of the earth. ✓✓/ *Die energie wat 'n voorwerp besit as gevolg van sy posisie/hoogte bo die oppervlak van die aarde.* (2)

7.2  $E_K = \frac{1}{2}mv^2$  ✓  
 $= (\frac{1}{2})(3)(0^2)$  ✓  
 $= 0 \text{ J}$  ✓  
 If only 0 J is given / *Indien slegs 0 J gegee (Max/Maks.  $\frac{2}{3}$ )* (3)

7.3  $E_P = mgh$  ✓  
 $= (3)(9,8)(4)$  ✓  
 $= 117,6 \text{ J}$  ✓ (3)

7.4  $E_M = E_K + E_P$  ✓  
 $= 0 + 117,6$  ✓  
 $= 117,6 \text{ J}$  ✓ (3)

7.5  $E_M = 117,6 \text{ J}$  ✓ (1)

7.6  $E_M = E_K + E_P \checkmark$   
 $= \frac{1}{2}mv^2 + mgh$   
 $117,6 \checkmark = (\frac{1}{2})(3)v^2 + (3)(9,8)(0) \checkmark$   
 $v = 8,85 \text{ m} \cdot \text{s}^{-1} \checkmark$  (4)  
[16]

**QUESTION 8/VRAAG 8**

8.1  
8.1.1 B  $\checkmark$  and/en C  $\checkmark$  (2)

8.1.2 B  $\checkmark$  (1)

8.1.3 C  $\checkmark$  (1)

8.1.4 A  $\checkmark$  and/en D  $\checkmark$  (2)

8.2  
8.2.1 Aluminium oxide  $\checkmark\checkmark$  / *Aluminiumoksied* (2)

8.2.2 Calcium sulphite  $\checkmark\checkmark$  / *Kalsiumsulfiet* (2)

8.3  
8.3.1  $\text{H}_2\checkmark\text{SO}_4\checkmark$  (2)

8.3.2  $(\text{NH}_4)_2\checkmark\text{CO}_3\checkmark$  (2)

8.4  
8.4.1 Wood  $\checkmark$  / *Hout* (1)

8.4.2 Copper  $\checkmark$  / *Koper* (1)

8.4.3 Iron  $\checkmark$  / *Yster* (1)

8.5  
8.5.1  $2\text{Na} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{H}_2$  Reactants/*Reaktante*  $\checkmark$   
Products/*Produkte*  $\checkmark$   
Balancing/*Balansering*  $\checkmark$  (3)

8.5.2  $2\text{C}_4\text{H}_{10} + 13\text{O}_2 \rightarrow 10\text{H}_2\text{O} + 8\text{CO}_2$  Reactants/*Reaktante*  $\checkmark$   
Products/*Produkte*  $\checkmark$   
Balancing/*Balansering*  $\checkmark$  (3)  
[23]

**GRAND TOTAL/GROOTTOTAAL: 150**