education

Department of Education
FREE STATE PROVINCE

CONTROL TEST / *KONTROLETOETS*

See modifications in English question paper.

GRADE 11 / *GRAAD 11*

PHYSICAL SCIENCES
FISIESE WETENSKAPPE

MEMORANDUM

MARCH 2019 / *MAART 2019*

MARKS: 100 / *PUNTE: 100*

TIME: 2 HOURS / *TYD: 2 UUR*

This memorandum consists of SEVEN pages.
Hierdie memorandum bestaan uit SEWE bladsye.

QUESTION 1/ *VRAAG 1*

1.1 B✓✓ 1.2 C✓✓

1.3 C✓✓ 1.4 C✓✓

1.5 B✓✓ 1.6 D✓✓

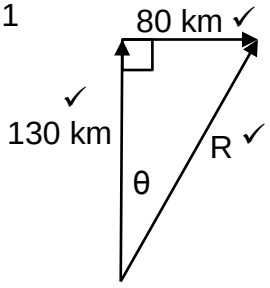
1.7 B✓✓ 1.8 D✓✓

1.9 B✓✓ Accept Q/*Aanvaar Q* 1.10 B✓✓

[20]

QUESTION 2/ *VRAAG 2*

2.1.1



Marking criteria/*Nasienriglyne*	
All vectors have arrowheads. *Alle vektore het pylpunte.*	1
All vectors correctly drawn with labels. *All vektore reg geteken met byskrifte.*	1
Correct direction of resultant/head-to-tail method used correctly. *Korrekte rigting van resultant/kop-by-stertmetode korrek gebruik.*	1

(3)

2.1.2 (130 + 80) = 210 km ✓ (1)

2.1.3 $130^2 + 80^2 = R^2$ ✓
$R = 152{,}64\ km$✓

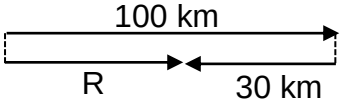
$tan\theta = \frac{opp}{adj}$
$tan\theta = \frac{80}{130}$✓
$\theta = 31{,}61°$✓ (4)

2.2 $D_y = Dcos\theta$
$= 22cos30°$✓
$= 19{,}05\ km$ ✓

OR/*OF*

$D_y = Dsin\theta$
$= 22sin60°$✓
$= 19{,}05\ km$ ✓ (2)

2.3



OPTION 1/*OPSIE 1*

+⟶

$R = 100 + (-30)$✓
$= 70\ m$
$= 70\ m\ east; oos$ ✓

OPTION 2/*OPSIE 2*

⟵+

$R = -100 + 30$✓
$= -70\ m$
$= 70\ m\ east; oos$✓

(2)

[12]

QUESTION 3/ *VRAAG 3*

3.1 A body will remain in its state of rest or motion at constant velocity unless a non-zero resultant/net force acts on it. ✓✓

'n Liggaam sal in sy toestand van rus of beweging teen konstante snelheid volhard tensy 'n nie-nul resulterende/netto krag daarop inwerk. (2)

NB: -1 if anyone of the underlined key words in the correct context is omitted.
NB: *-1 as enigeen van die onderstreepte sleutelwoorde in die korrekte konteks uitgelaat is*

3.2 0,7 N✓ left/*links*✓ (2)

3.3

$w = mg$✓
$= (0{,}4)9{,}8)$✓
$= 3{,}92\ N$
$\therefore N = 3{,}92\ N$✓

Accept/
$N = w = mg$✓
$= (0{,}4)(9{,}8)$✓
$= 3.92\ N$✓

(3)

3.4 The force that opposes the motion of a moving object relative to a surface and acts parallel to the surface. ✓✓

Die krag wat die beweging van 'n voorwerp relatief tot 'n oppervlak teenwerk en parallel aan die oppervlak inwerk. (2)

NB: -1 if anyone of the underlined key words in the correct context is omitted.
NB: *-1 as enigeen van die onderstreepte sleutelwoorde in die korrekte konteks uitgelaat is*

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

$f_k = \mu N$ ✓
$0{,}7 = \mu(3{,}92)$ ✓
$\mu = 0{,}18$✓ (3)

3.6.1 Increase/*Neem toe* ✓ (1)

3.6.2 Remains the same/*Bly dieselfde* ✓ (1)

3.6.3 Decrease/*Neem af* ✓ (1)

[15]

QUESTION 4/ *VRAAG 4*

4.1 For the 2 kg mass

$F_{net} = ma$
$T - w_{\parallel} = ma$ ✓
$T - mgsin\theta = ma$
$T - (2)(9{,}8)sin30°$✓ $= (2)(1{,}5)$✓
$T = 12{,}8\ N$ ✓ (4)

1 mark for any/

4.2 For the 2 kg mass

$F_{net} = ma$
$T - w_{\parallel} = ma$
$T - mgsin\theta = ma$
$T - (2)(9{,}8)sin30°$✓ $= 0$ ✓
$T = 9{,}8\ N$

For the 0,8 kg mass (+)

$F_{net} = ma$
$F - T - w_{\parallel} = ma$
$F - T - mgsin\theta = ma$
$F - 9{,}8 - (0{,}8)(9{,}8)sin30°$ ✓ $= 0$ ✓
$T = 13{,}72\ N$ ✓ (5)

[9]

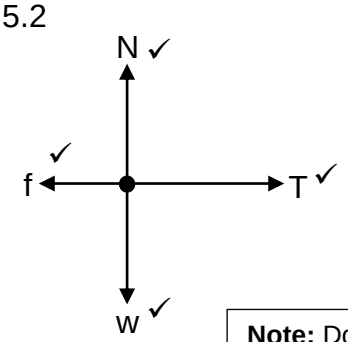
QUESTION 5/ *VRAAG 5*

5.1 When a resultant/net force acts on an object, the object will accelerate in the direction of the force at an acceleration directly proportional to the force and inversely proportional to the mass of the object. ✓✓

Wanneer 'n resulterende/netto krag op 'n voorwerp inwerk, sal die voorwerp in die rigting van die krag versnel teen 'n versnelling direk eweredig aan die krag en omgekeerd eweredig aan die massa van die voorwerp. (2)

NB: -1 if anyone of the underlined key words in the correct context is omitted.
NB: *-1 as enigeen van die onderstreepte sleutelwoorde in die korrekte konteks uitgelaat is*

5.2



Accepted labels/*Aanvaarbare byskrifte*	
w	F_g / F_w / force of Earth on block / weight/ mg / gravitational force *F_g / F_w / krag van Aarde op blok / gewig / mg / gravitasiekrag* 274,4 N not acceptable/ *nie aanvaarbaar nie*
N	F_N/normal / *normaal*
f	F_f / f_k / Friction force / wrywingskrag
T	F_T/Tension in rope / *Spanning in die tou*

Note: Do not penalise for length of arrows.
Nota: *Moenie vir lengte van pyle penaliseer nie.*

(4)

5.3.1 $f_s^{max} = \mu_s N$✓
$= \mu mg$
$= (0{,}45)(28)(9{,}8)$✓
$= 123{,}48\ N$✓
$Minimum\ force; Minimum\ krag > 123{,}48\ N$ ✓ (4)

5.3.2 **POSITIVE MARKING FROM 5.3.1./*POSITIEWE NASIEN VANAF 5.3.1.***
$F_{net} = ma$ ✓
$mg - T = ma$
$(1 + m_s)(9{,}8) - 123{,}48 = 0$✓
$\boldsymbol{m_s = 11{,}6\ kg}$✓
$\boldsymbol{Mass\ of\ sand; Massa\ van\ sand > 11{,}6\ kg}$✓ (4)

5.3.3 **POSITIVE MARKING FROM 5.3.2/*POSITIEWE NASIEN VANAF 5.3.2.***
$f_k = \mu_k N$
$f_k = \mu_k mg$
$= (0{,}32)(28)(9{,}8)$
$= 87{,}808\ N$

$\boldsymbol{F_{net} = ma}$
$\boldsymbol{T - f_k = ma}$
$T - 87{,}808$✓ $= 28a$ ✓

System approach/*Sisteembenadering*: 3/5

$F_{net} = ma$
$mg - f_k = ma$
$(13{,}6)(9{,}8) - 87{,}808$✓ $= 41{,}6a$ ✓
$\therefore a = 1{,}09\ m \cdot s^{-2}$ ✓

$\boldsymbol{F_{net} = ma}$
$\boldsymbol{mg - T = ma}$
$(1 + 12{,}6)(9{,}8) - T$✓ $= (1 + 12{,}6)a$ ✓

$\therefore a = 1{,}09\ m \cdot s^{-2}$ ✓ (5)
[19]

QUESTION 6/ *VRAAG 6*

6.1 Each particle in the universe attracts every other particle with a (gravitational) force that is directly proportional to the product of their masses and inversely proportional to the square of the distance between their centres. ✓✓

Elke deeltjie in die heelal trek elke ander deeltjie aan met 'n (gravitasie)krag wat direk eweredig aan die produk van hulle massas en omgekeerd eweredig aan die kwadraat van die afstand tussen hulle middelpunte is. (2)

NB: -1 if anyone of the underlined key words in the correct context is omitted.
NB: *-1 as enigeen van die onderstreepte sleutelwoorde in die korrekte konteks uitgelaat is*

6.2 $F_{SM} = \frac{Gm_1m_2}{r^2}$ ✓

$= \frac{(6{,}67\times10^{-11})(1{,}99\times10^{30})(7{,}35\times10^{22})}{(1{,}5\times10^{11})^2}$ ✓✓

$= 4{,}3359 \times 10^{20}\ N$

$F_{EM;AM} = \frac{Gm_1m_2}{r^2}$

$= \frac{(6{,}67\times10^{-11})(5{,}98\times10^{24})(7{,}35\times10^{22})}{(3{,}84\times10^{8})^2}$ ✓✓

$= 1{,}988 \times 10^{20}\ N$

$R^2 = F_1^2 + F_2^2$

$F_{net} = \sqrt{(1{,}988 \times 10^{20})^2 + (4{,}3359 \times 10^{20})^2}$ ✓

$F_{net} = 4{,}77 \times 10^{20}\ N$ ✓ (7)

[9]

QUESTION 7/ *VRAAG 7*

7.1 A mutual attraction between two atoms resulting from the simultaneous attraction between their nuclei and the outer electrons. ✓✓

Die wedersydse aantrekking tussen twee atome as gevolg van die gelyktydige aantrekking tussen hulle kerne en buite-elektrone. (2)

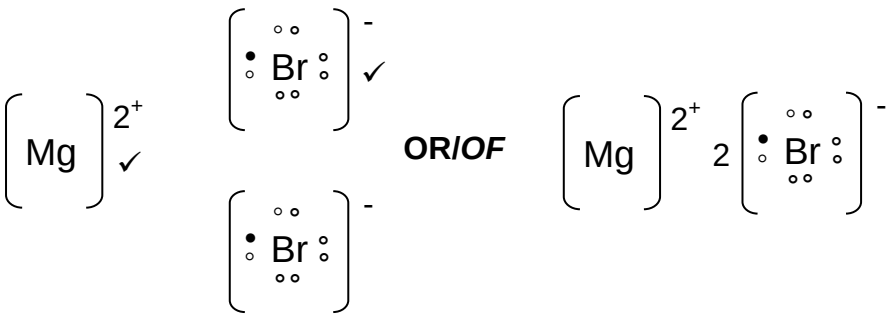
NB: -1 if anyone of the underlined key words in the correct context is omitted. ***NB:*** *-1 as enigeen van die onderstreepte sleutelwoorde in die korrekte konteks uitgelaat is*

7.2 Ionic/I*onies*✓ (1)

7.3.1 6 ✓ (1)

7.3.2 2 ✓ (1)

7.4



Marking criteria/Nasienriglyne	
Two bromide ions; each with eight electrons and correct charge. *Twee bromiedione; elk met agt elektrone en korrekte lading.*	1
One magnesium ion with correct charge and no electrons. Een magnesiumioon met korrekte lading en geen elektrone.	1

(2)

7.5.1 Trigonal planar/*Trigonaal-planêr* ✓✓ (2)

7.5.2 Angular /*Hoekig* ✓✓ (2)

7.5.3 Octahedral/*Oktahedries* ✓ (1)
[12]

QUESTION 8/ *VRAAG 8*

8.1 The energy needed to break one mole of molecules (of a compound) into separate atoms. ✓✓

Die energie benodig om een mol molekule (van 'n verbinding) op te breek in aparte atome. (2)

NB: -1 if anyone of the underlined key words in the correct context is omitted.
NB: *-1 as enigeen van die onderstreepte sleutelwoorde in die korrekte konteks uitgelaat is*

8.2 Bond length of HF is smaller than that of HCℓ. ✓
Bond energy increases as bond length decreases. ✓

Bindingslengte van HF is kleiner as die van HCℓ.
Bindingsenergie neem toe soos bindingslengte afneem.

OR/*OF*

Bond length of HCℓ is bigger than that of HF. ✓
Bond energy decreases as bond length increases. ✓

Bindingslengte van HCℓ is groter as die van HF.
Bindingsenergie neem af soos bindingslengte toeneem. (2)
[4]

GRAND TOTAL/ *GROOTTOTAAL* : 100