education

Department of Education
FREE STATE PROVINCE

JUNE EXAMINATION/*JUNIE EKSAMEN*

Stanmorephysics.com

GRADE/*GRAAD* 11

PHYSICAL SCIENCES
FISIESE WETENSKAPPE

MEMORANDUM

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JUNE/*JUNIE* 2025

MARKS/*PUNTE*: 150

TIME: 3 HOURS
TYD: 3 URE

This marking guideline consists of 13 pages.

Hierdie nasienriglyn bestaan uit 13 bladsye.

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QUESTION 1/*VRAAG 1*

1.1 D ✓✓

1.2 D ✓✓

1.3 B ✓✓

1.4 B ✓✓

1.5 D ✓✓

1.6 C ✓✓

1.7 D ✓✓

1.8 B ✓✓

1.9 B ✓✓

1.10 D ✓✓



[10 × 2] = 20

QUESTION 2/*VRAAG 2*

2.1 The vector sum of two or more vectors✓✓ OR The single vector having the same effect as two or more vectors / *Die vektorsom van twee of meer vektore OF Die enkele vektor wat dieselfde effek het as twee of meer vektore.* (2)

2.2 The brick is moving at constant velocity/ acceleration of zero / $F_{net} = 0$✓✓ / *Die baksteen beweeg teen konstante snelheid/versnelling van nul/* $F_{net} = 0$ (2)

2.3

Option/*Opsie* 1	**Option/*Opsie* 2**
$F_{Y1} = F_1 \sin 70°$ $= 730 \sin 70°$✓ $= 685.98$N✓	$F_{Y1} = F_1 \sin 20°$ $= 730 \cos 20°$✓ $= 685.98$N✓

(2)

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2.4 **Positive marking from question 2.3 (underlined) and option 1 or 2/**
Positief nasien vanaf vraag 2.3 (onderstreep) en opsie 1 of 2

Option/*Opsie* 1	**Option/*Opsie* 2**
$F_{y2} = F_2 \cos 10°$ $= 1440 \cos 10°$ ✓ $= 1418{,}12$ N	$F_{y2} = F_2 \sin 80°$ $= 1440 \sin 80°$ ✓ $= 1418{,}12$ N

$w = F_{Y1} + F_{y2}$

$= \underline{685.98 \text{ N}} + 1418{,}12 \text{ N}$ ✓ adding/ *bymekaartel* ✓

$= 2104$ N ✓

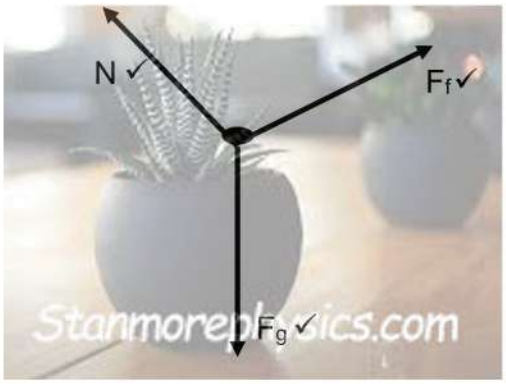
(4)

2.5 If the distance R between the two pulleys increase <u>the vertical components of the applied force will decrease</u>✓, and the system will not be able <u>to pick up the brick as the weight will be more than the upwards vertical components of the forces</u>✓OR <u>there will be a net force downwards./ *As die afstand R tussen die twee katrolle toeneem, sal die vertikale komponente van die toegepaste kragte afneem en die stelsel sal nie die baksteen kan optel nie, aangesien die gewig meer as die opwaartse vertikale komponente van die kragte sal wees OF daar sal 'n netto krag afwaarts wees.*</u>

(2)
[12]

QUESTION 3 / *VRAAG 3*

3.1



Force/*Krag*	Accepted labels/*Aanvaarde byskrifte*
F_f	$F_{friction}$/ f/ kinetic friction/ $F_{wrywing}$/*kinetiese wrywing*
F_g	F_w/ w/ weight/ mg/ gravitational force/*gewig/ gravitasiekrag*
N	F_N/ F_{normal}/ Normal force/ $F_{normaal}$/ *Normaalkrag*

NOTES:/*NOTAS*
• One mark for each arrow and correct label. / *Een punt vir elke pyl en korrekte byskrif.* • Penalise ONCE for each of the following:/ *Penaliseer EENMALIG vir elk van die volgende:* No arrows/ *Geen pyle* No dot / *Geen kol* Space between dot and arrow/ *Spasie tussen kol en pyl* Dotted lines drawn / *Stippelyne geteken* Force diagram is drawn / *Kragtediagram geteken.*

(3)

3.2

MARKING CRITERIA / *NASIENRIGLYN*
Any one of the two formulas ✓/ *Enige een van die twee formules* Co-efficient substitution ✓ / *Koëffisiëntvervanging* Component of weight ✓ / *Gewigskomponent* Answer with unit and direction ✓/ *Antwoord met eenheid en rigting*

Option/*Opsie* 1	**Option/*Opsie* 2**
$f_k = \mu_k N$ ✓ $= \mu_k mg\cos\theta$ $= (0,15)$✓$(30)(9,8\cos 30°)$✓ $= 38,19$ N ✓	$f_k = \mu_k N$ ✓ $= \mu_k mg\sin\theta$ $= (0,15)$✓$(30)(9,8\sin 60°)$✓ $= 38,19$ N ✓
Option 3/*Opsie 3*	**Option 4/*Opsie 4***
$w = mg\cos\theta$ $= (30)(9,8\cos 30°$✓$)$ ✓ $= 254,61$ N $f_k = \mu_k N$ $= 0,15(254,61)$ $= 38,19$ N ✓	$w = mg\sin\theta$ $= (30)(9,8\sin 60°$✓$)$ ✓ $= 254,61$ N $f_k = \mu_k N$ $= 0,15$✓ $(254,61)$ $= 38,19$ N ✓

(4)

3.3 INCREASE/*VERHOOG*✓ (1)

3.4 Remain the same. ✓ The coefficient is only affected by the type of surfaces moving with respect to each other. ✓/ *Bly dieselfde. Die koëffisiënt word slegs beïnvloed deur die tipe oppervlaktes wat ten opsigte van mekaar beweeg.* (2)

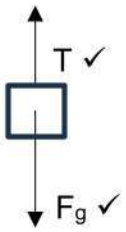
[10]

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QUESTION 4 / *VRAAG 4*

4.1.1 When a resultant/ net force acts on the 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 die voorwerp inwerk, sal die voorwerp versnel in die rigting van die krag teen 'n versnelling direk eweredig aan die krag en omgekeerd eweredig aan die massa van die voorwerp.* (2)

4.1.2



Acceptable lables/*Aanvaarde benoemings*	
F_g	F_w/ w/ weight/ mg/ gravitational force/ *gewig/gravitasiekrag*
T	FT/Tension/*Spanning*

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Marking criteria:/*Nasienriglyn*
-1 Mark/*Punt* if a free body diagram was drawn/*indien 'n vrye ligaamdiagram geteken was*

-1 Mark/*Punt* if F_g not drawn from centre/ *as F_g nie van die middel geteken was nie*

(2)

4.1.3

Marking criteria:/*Nasienriglyn*
Formula ✓/*Formule*
Substitution of both masses ✓/ *Substitusie van beide massas*
Substitution of F_g and T : 1 mark for each block ✓✓ / *Substitusie van F_g en T : 1 punt vir elke blok*
Two equations equal to each other✓/ *Twee vergelykings gelyk aanmekaar stel*
Answer for acceleration with correct SI unit.✓/ *Antwoord vir versnelling met korrekte SI eenheid*

OPTION 1/*OPSIE 1*	**OPTION 2/*OPSIE 2***
For 500 g block/*Vir 500 g blok*	*For 500 g block Vir 500 g blok*
$F_{net} = ma$ $F_g + (-T) = ma$ } Any one✓ *Enigeen*	$F_{net} = ma$ $F_g + (-T) = ma$ } Any one✓ *Enigeen*
$(0,5 \times 9,8) + (-T)$ ✓$= 0,5a$ $T = -0,5a + 4,9$…..(1)	$(0,5 \times 9,8) + (-T)$ ✓$= 0,5a$ $T = -0,5a + 4,9$…..(1)
For 350 g block/ Vir 350 g blok ✓	*For 350 g block/ Vir 350 g blok* ✓
$F_{net} = ma$ $T + (-F_g) = ma$ $T + (-0,35 \times 9,8)$ ✓$= 0,35a$ $T = 0,35a + 3,43$ …..(2)	$F_{net} = ma$ $T + (-F_g) = ma$ $T + (-0,35 \times 9,8)$ ✓$= 0,35a$ $T = 0,35a + 3,43$ …..(2)
(1) = (2) $-0,5a + 4,9 = 0,35a + 3,43$✓ $a = 1,73\ m{\cdot}s^{-2}$ ✓	(1) = (2) $9,8 - 2T = \frac{T}{0,35} - 9,8$✓ $T = 4,035\ N$ $a = 1,73\ m{\cdot}s^{-2}$ ✓

(6)

4.2.1 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 gravitasiekrag wat direk eweredig is aan die produk van hul massas en omgekeerd eweredig is aan die kwadraat van die afstand tussen hul middelpunte.* (2)

4.2.2

Marking criteria:/*Nasieriglyn*
Formula ✓ / *Formule* Substitution of numerator ✓ / *Substitusie van noemer* Substitution of distance ✓ / *Substitusie van afstand* Final answer with SI unit ✓ / *Finale antwoord met SI eenheid*
$F = \frac{Gm_1m_2}{r^2}$ ✓ $F = \frac{(6,67 \times 10^{-11})(5,98 \times 10^{24})(3500)}{(15\,000+6,38 \times 10^{6})^2}$ ✓✓ $F = 34136,1$ N ✓

(4)

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4.2.3 Positive marking from 4.2.2/ *Positief nasien vanaf 4.2.2*

Marking criteria:/*Nasienriglyn*
Substitution of $F_{earth\ \&\ sat\ A}$ ✓/ *Sustitusie van* $F_{aarde\ en\ sateliet\ A}$ Adding forces ✓ / *Tel kragte bymekaar* Final answer with SI unit ✓ / *Finale antwoord met SI eenheid*
$F_{net} = F_{earth\ on\ B} + F_{earth\ on\ A}$ ✓ $F_{net} = 2{,}74 \times 10^3$ N - 34136,1 N ✓ $F_{net} =$ 31396,1 N ✓

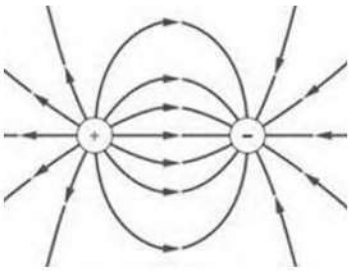
(3)
[19]

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QUESTION 5 / *VRAAG 5*

5.1.1

Marking criteria/ Nasienriglyn	
Charges indicated correctly / *Ladings korrek aangedui*	✓
Correct shape / *Korrekte vorm*	✓
Correct direction of arrows / *Korrekte rigting van pyle*	✓



(3)

5.1.2 The magnitude the electrostatic force exerted by one point charge on another point charge is directly proportional to the product of the magnitudes of the charges and inversely proportional to the square of the distance between them. ✓✓ / *Die grootte van die elektrostatiese krag wat een puntlading op 'n ander puntlading uitoefen, is direk eweredig aan die produk van die groottes van die ladings en omgekeerd eweredig aan die kwadraat van die afstand tussen hulle* ✓✓ (2)

5.1.3 $F = \frac{kQ_1Q_2}{r^2}$ ✓

$$= \frac{(9 \times 10^9)(1{,}6 \times 10^{-19})(1{,}6 \times 10^{-19})}{(5 \times 10^{-11})^2} \checkmark$$

$$= 9{,}22 \times 10^{-8}\ N \checkmark$$

(4)

5.2.1
$$E = \frac{kQ_A}{r^2} \checkmark$$
$$= \frac{(9\times10^9)(4\times10^{-6})}{(0,2)^2} \checkmark$$
$$= 9 \times 10^5\ N \cdot C^{-1} \checkmark$$
(3)

5.2.2

OPTION 1/*OPSIE 1*

$$E_{net} = E_A + E_B$$
$$E_{net} = \frac{kQ_A}{r_A^2} + \frac{kQ_B}{r_B^2}$$
Anyone✓/*Enigeen*

$$0\checkmark = \frac{(9\times10^9)(4\times10^{-6})}{(r)^2} \checkmark \quad -\checkmark \quad \frac{(9\times10^9)(2\times10^{-6})}{(0,5-r)^2} \checkmark$$

$$\therefore \frac{(9\times10^9)(2\times10^{-6})}{(0,5-r)^2} = \frac{(9\times10^9)(4\times10^{-6})}{(r)^2}$$
$$\therefore 18000r^2 = 36000(0,5-r)^2$$
$$\therefore 18r^2 = 36(0,25 - r + r^2)$$
$$0 = 2r^2 - 4r + 1$$

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r = 0,29 m or/*of* r = 1,71 m
∴ r = 0,29 m ✓

OPTION 2/*OPSIE 2*

$$F_{net} = F_A + F_B$$
$$F_{net} = \frac{kQ_AQ_C}{r_A^2} + \frac{kQ_BQ_C}{r_B^2}$$
Anyone✓/*Enigeen*

$$0\checkmark = \frac{(9\times10^9)(4\times10^{-6})Q}{(r)^2} \checkmark \quad -\checkmark \quad \frac{(9\times10^9)(2\times10^{-6})Q}{(0,5-r)^2} \checkmark$$

$$\therefore \frac{(9\times10^9)(2\times10^{-6})Q}{(0,5-r)^2} = \frac{(9\times10^9)(4\times10^{-6})Q}{(r)^2}$$

$$\therefore 18000r^2 = 36000(0,5-r)^2$$
$$\therefore 18r^2 = 36(0,25 - r + r^2)$$
$$0 = 2r^2 - 4r + 1$$

r = 0,29 m or/*of* r = 1,71 m
∴ r = 0,29 m ✓

Marking criteria / *Nasienriglyn*	
Correct formula / *korrekte formule*	✓
$E_{net} = 0$	✓
Substitution of values in E-formulas / *Substitusie van waardes in E-formules*	✓✓
Opposite directions /- sign / *Teenoorgestelde rigtings / - teken*	✓
Final answer / *Finale antwoord*	✓

(6)
[18]

QUESTION 6 / *VRAAG 6*

6.1.1 The magnitude of the induced emf across the ends of a conductor is directly proportional to the rate of change in the magnetic flux linkage with the conductor. ✓✓/ *Die grootte van die geinduseerde emk oor die ente van 'n geleier, is direk eweredig aan die tempo van verandering van die magnetiese vloedkoppeling met die geleier.* (2)

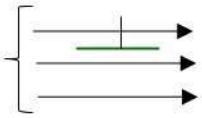
6.1.2 2 / doubled ✓✓/ *Verdubbel* (2)

6.2.1 Rotate the plate in the opposite/anticlockwise direction✓ Change around the poles of the magnet / the direction of magnetic field✓/ *Roteer die plaat in die teenoorgestelde / antikloksgewyse rigting. Ruil die pole van die magneet om / verander die rigting van die magneetveld* (2)

6.2.2 $\Phi = BA\cos\theta$ ✓

$= (0,5)(0,04 \times 0,06)$✓ $\cos 90°$ ✓

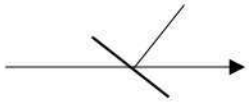
$= 0$ Wb (3)



6.2.3(a) $\Delta\Phi = \Phi_f - \Phi_i$ ✓

$= (0,5)(0,04 \times 0,06) \cos 60°$✓ $- 0$✓

$= 6 \times 10^{-4}$ Wb ✓ (4)



6.2.3(b) **POSITIVE MARKING FROM QUESTION 6.2.3(a) / *MERK POSITIEF VANAF VRAAG 6.2.3(a)***

$$\varepsilon = -\frac{N\Delta\emptyset}{\Delta t} \quad \checkmark$$

$$= -\frac{(1)(6 \times 10^{-4})}{2 \times 10^{-3}} \checkmark$$

$$= 0,3\,V \quad \checkmark$$

(3)

[16]

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QUESTION 7 / *VRAAG 7*

7.1.1 The potential difference across a conductor is directly proportional to the current in the conductor at constant temperature.✓✓/ *Die potensiaalverskil oor 'n geleier is direk eweredig aan die stroom in die geleier by konstante temperatuur.* (2)

7.1.2 X✓ The potential difference is directly proportional to the current/The graph is a straight line.✓/ *Die potensiaalverskil is direk eweredig aan die stroom / Die grafiek is 'n reguitlyn.* (2)

7.1.3 Low current OR Low temperature✓/ *Lae stroom OF Lae temperatuur* (1)

7.2.1 $\text{Gradient} = \frac{\Delta V}{\Delta I}$ ✓

$= \frac{1-0}{0,6-1}$ ✓

$= -2,5$ ✓ $r_i = 2,5\ \Omega$ (4)

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7.2.2 Internal resistance / r_i / *Interne weerstand* ✓ (1)

7.2.3 **POSITIVE MARKING FROM QUESTION 7.2.1 / *POSITIEF NASIEN VANAF VRAAG 7.2.1***

$\text{Gradient} = \frac{\Delta V}{\Delta I}$

-2,5✓ $= \frac{1-X}{0,6-0}$ ✓

$X = 2,5\ V$✓ (3)

7.2.3 **POSITIVE MARKING FROM QUESTION 7.2.1 and 7.2.3 / *POSITIEF NASIEN VANAF VRAAG 7.2.1 en 7.2.3***

$\varepsilon = I(R + r)$✓

$2,5 = 0,6(R + 2,5)$ ✓

$R = 1,67\ \Omega$✓ (3)

[15]

QUESTION 8 / *VRAAG 8*

8.1 $R_t = \frac{\varepsilon}{I_t}$ ✓ $= \frac{12}{1,2}$ ✓ $= 10\ \Omega$✓ (3)

8.2 **POSITIVE MARKING FROM QUESTION 8.1 / *POSITIEF NASIEN VANAF VRAAG 8.1***

OPTION 1/ *OPSIE 1*	**OPTION 2/ *OPSIE 2***
$r_i = Rt - R_{external/ekstern}$ ✓ $= 10 - (2+5,6)$ ✓ $= 2,4\ \Omega$✓	$\varepsilon = I(R + r)$✓ $12 = 1,2(7,6$✓$ + r)$ $r_i = 2,4\ \Omega$✓

(3)

8.3 $W = I^2Rt$✓
$= 1,2^2x2x180$✓
$= 518,4J$✓ (3)

8.4 R_t smaller✓, I_t increases✓ thus from $P = I^2R$✓ the power will be more✓. (4)
[13]

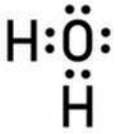
QUESTION 9 / *VRAAG 9*

9.1 The sharing of electrons between two atoms to form a molecule ✓✓/
Die deel van elektrone tussen twee atome om 'n molekule te vorm. (2)

9.2.1 **Marking Criteria/ *Nasienkriteria***

- Angular structure OR 8 valence electrons in total✓ */Hoekige struktuur OF 8 valenselektrone in totaal*

- 2 lone pairs around oxygen✓ / *2 alleenpare rondom suurstof*



(2)

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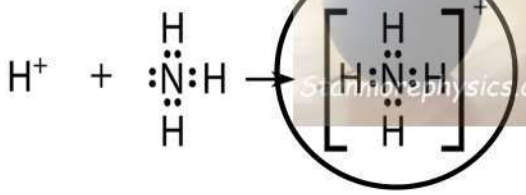
9.2.2 The bonds have an electronegativity difference OR the covalent bonds are polar ✓ Molecular geometry is asymmetrical/bent/ angular OR the central atom has a lone pair valence electrons ✓ / *Die bindings het 'n elektronegatiwiteitsverskil OF die kovalente bindings is polêr. Molekulêre vorm is asimmetries/gebuig/hoekig OF die sentrale atoom het 'n alleenpaar valenselektrone.* (2)

9.3 3 ✓✓ (2)

9.4.1 Dative covalent bond✓✓ / *Datief kovalente binding* (2)

9.4.2 Marking criteria / *Nasienkriteria*

- Indicating the ionic charge. ✓ /*Dui die ioniese lading aan*
- The H- ion bonding to lone pair.✓/ *Die H -ioon op alleenpaar*
- 8 electrons around the N atom.✓ / *8 elektrone om N atoom*



(3)
[13]

QUESTION 10 / *VRAAG 10*

10.1 Temperature at which the vapour pressure of a liquid equals atmospheric pressure.✓✓ / *Die temperaruur waar die dampdruk van 'n vloeistof gelyk is aan die atmosferiese druk.* (2)

10.2 Both the iodine and bromine have only London forces between their respective molecules.✓
Iodine is a larger molecule compared to bromine/Molecular mass of Iodine is greater than the molecular mass of bromine.✓
As a result, Iodine will have stronger London forces between the molecules.✓
Thus, more energy will be required to overcome the intermolecular forces between the Iodine molecules.✓
OR
Both the iodine and bromine have only London forces between their respective molecules.✓
Bromine is a smaller molecule compared to Iodine /Molecular mass of bromine is less than the molecular mass of iodine.✓
As a result, bromine will have weaker London forces between the molecules.✓
Thus, less energy will be required to overcome the intermolecular forces between the bromine molecules.✓ /

Beide die jodium en broom het slegs Londenkragte tussen hul onderskeie molekules.
Jodium is 'n groter molekule in vergelyking met broom / Molekulêre massa van jodium is groter as die molekulêre massa van broom.
Gevolglik sal jodium sterker Londenkragte tussen die molekules hê.
Dus sal meer energie benodig word om die intermolekulêre kragte tussen die jodiummolekules te oorkom.
OF
Beide die jodium en broom het slegs Londenkragte tussen hul onderskeie molekules.
Broom is 'n kleiner molekule in vergelyking met jodium / Molekulêre massa van broom is minder as die molekulêre massa van jodium.
Gevolglik sal broom swakker Londenkragte tussen die molekules hê.
Dus sal minder energie benodig word om die intermolekulêre kragte tussen die broommolekules te oorkom. (4)

10.3 Hydrogen bond ✓ / *Waterstogbinding* (1)

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10.4 Hydrogen Fluoride ✓ / *Waterstoffluoried* (1)

10.5.1 Induced/Temporary dipole✓- dipole forces✓ /
Tydelike/Geïnduseerde dipool-dipool kragte (2)

10.5.2 Carbon dioxide molecules are <u>non-polar</u>✓ and have <u>London forces</u>✓ between the molecules.
Water molecules are <u>polar</u> ✓ and have hydrogen bonds between them.
The intermolecular forces are of <u>incomparable strength/polar and non-polar substances do not mix.</u> ✓ /
Koolstofdioksiedmolekules is <u>nie-polêr</u> en het <u>Londenkragte</u> tussen die molekules. Watermolekules is <u>polêr</u> en het waterstofbindings tussen hulle. Die intermolekulêre kragte is van <u>onvergelykbare sterkte/polêr en nie-polêre stowwe meng nie</u>. (4)
[14]

<u>GRAND TOTAL/*GROOTTOTAAL*: 150</u>