



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE/
NASIONALE
SENIOR SERTIFIKAAT**

GRADE/GRAAD 11

**PHYSICAL SCIENCES: PHYSICS (P1)
FISIESE WETENSAPPE: FISIKA (V1)**

NOVEMBER 2017

MARKING GUIDELINES/NASIENRIGLYNE

MARKS/PUNTE: 150

DEPARTMENT OF BASIC EDUCATION
PRIVATE BAG X895, PRETORIA 0001
2017 -11- 06
APPROVED MARKING GUIDELINE PUBLIC EXAMINATION

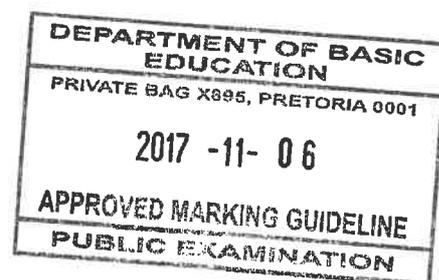
**These marking guidelines consist of 14 pages.
Hierdie nasienriglyne bestaan uit 14 bladsye.**

*Approved
Zayangi
2017: 11: 05
Ant-Mod.*

*Approved
Mkeelma
2017/11/5
Chief Examiner*

QUESTION/VRAAG 1

- | | | |
|------|------|-------------|
| 1.1 | D ✓✓ | (2) |
| 1.2 | A ✓✓ | (2) |
| 1.3 | D ✓✓ | (2) |
| 1.4 | C ✓✓ | (2) |
| 1.5 | B ✓✓ | (2) |
| 1.6 | C ✓✓ | (2) |
| 1.7 | B ✓✓ | (2) |
| 1.8 | D ✓✓ | (2) |
| 1.9 | C ✓✓ | (2) |
| 1.10 | B ✓✓ | (2) |
| | | [20] |



mk §

QUESTION/VRAAG 2

- 2.1 The vector sum of two or more vectors. ✓✓
Die vektorsom van twee of meer vektore. ✓✓

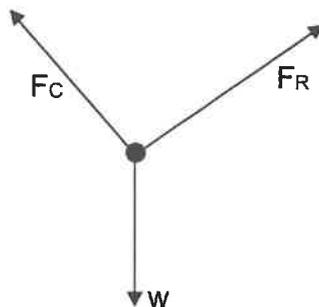
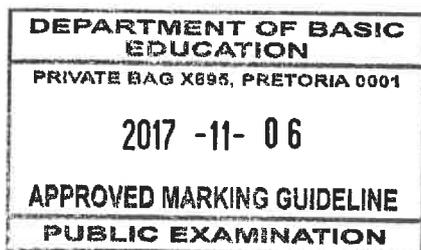
OR/OF

The single vector which has the same effect as two or more vectors (acting) together.

Die enkele vektor met dieselfde effek as twee of meer vektore saam. (2)

- 2.2 0 N ✓ (Accept 0/Zero Aanvaar 0/Nul) (1)

- 2.3 (3)



Notes: Accepted Labels/Aanvaarbare Byskrifte		Mark/Punt
w	weight/ F_G/F_g <i>gewig/gravitasiekrag/swaartekrag</i>	✓
F_C	Tension force in cable/ T_C <i>Spanningskrag in kabel/T_C</i>	✓
F_R	Tension force in rope/ T_R <i>Spanningskrag in tou/T_R</i>	✓
	Any additional force: deduct 1 mark (maximum $\frac{2}{3}$) <i>Enige addisionele krag: trek 1 punt af (maksimum $\frac{2}{3}$)</i>	
	Lines must touch object otherwise (maximum $\frac{2}{3}$) <i>Lyne moet voorwerp raak anders (maksimum $\frac{2}{3}$)</i>	
	Subtract one mark if arrows are not shown <i>Trek een punt af indien pylpunte nie gewys word nie</i>	

- 2.4 200 N ✓ (to the left/links) (1)

- 2.5 **POSITIVE MARKING FROM QUESTION 2.4**
POSITIEWE NASIEN VANAF VRAAG 2.4

$$F_{RY} = \frac{200}{\tan 35^\circ} \checkmark = 285,63 \text{ N}$$

$$F_g = mg = 56(9,8) \checkmark = 548,8 \text{ N}$$

$$\left. \begin{array}{l} F_{RY} + F_{CY} = F_g \\ 285,63 + F_{CY} = 548,8 \end{array} \right\} \checkmark \text{ any one/enige een}$$

$$F_{CY} = 263,17 \text{ N} \checkmark \text{ (upwards/opwaarts)} \quad (4)$$

Mark allocation: PunttoekeningCalculating/Bereken F_{RY} ✓

Calculating weight/Bereken gewig ✓

Vector sum/vektorsom ✓

Answer/Antwoord ✓

2.6 **POSITIVE MARKING FROM QUESTION 2.4 and 2.5**
POSITIEWE NASIEN VANAF VRAAG 2.4 en 2.5

$$\tan \theta = \frac{263,17}{200} \checkmark$$

$$\theta = 52,77^\circ \checkmark$$

(2)
[13]

QUESTION/VRAAG 3

3.1	Criteria for hypothesis/Riglyne vir hipotese	
	State the relationship between the correct dependent and independent variables. <i>Stel die verwantskap tussen die korrekte afhanklike en onafhanklike veranderlike.</i>	✓
	The controlled variable is stated as part of the hypothesis <i>Die gekontroleerde veranderlike word genoem as deel van die hipotese</i>	✓
	Dependent variable/afhanklike veranderlike: acceleration/versnelling Independent variable/onafhanklike veranderlike: (net) force/(netto) krag	

Example/Voorbeeld:

The acceleration is directly proportional to (net) force ✓ if the mass of the trolley is kept constant ✓

Die versnelling is direk eweredig aan die (netto) krag ✓ indien die massa van die trollie konstant bly ✓

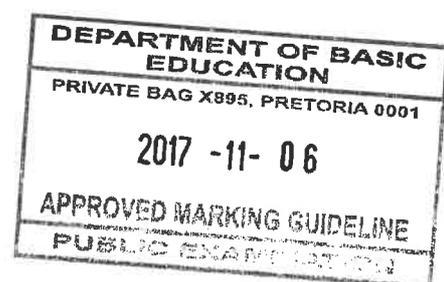
(2)

3.2.1 (Net) Force ✓
(Netto) Krag ✓

(1)

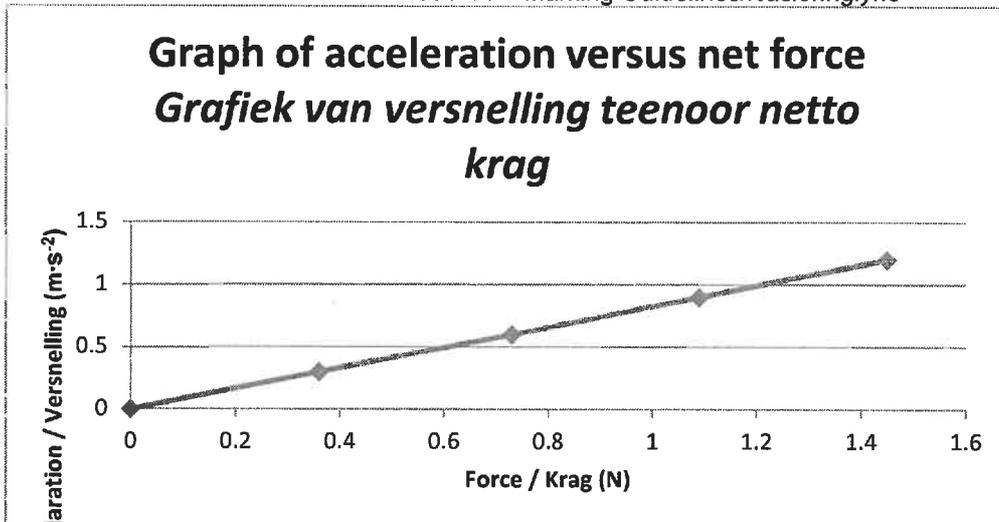
3.2.2 Mass of trolley ✓
Massa van die trollie ✓

(1)



Mk §

3.3



Refer to back of memo for graph drawn to scale

Verwys na die laaste bladsy van memorandum vir skaalgrafiek

Marking criteria for graph Nasienkriteria vir grafiek	
Axes with correct/appropriate scale <i>Asse met korrekte/toepaslike skaal</i>	✓
3 or more coordinates correctly plotted <i>3 of meer koördinate korrek gestip</i> If 2 coordinates correctly plotted - one mark <i>Indien 2 koördinate korrek gestip – een punt</i>	✓✓
Drawing a line of best fit through the origin <i>Teken 'n lyn van beste passing deur die oorsprong</i>	✓

(4)

3.4

Accept any set of coordinates from the graph, for example:

Aanvaar enige kombinasie van koördinate vanaf die grafiek, byvoorbeeld:

$$\text{gradient} = \frac{1,45 - 0,36}{1,2 - 0,3} \checkmark = 1,21 \checkmark$$

OR/OF

$$\text{gradient} = \frac{1,09 - 0}{0,9 - 0} \checkmark = 1,21 \checkmark$$

OR/OF

$$\text{gradient} = \frac{0,73 - 0}{0,6 - 0} \checkmark = 1,22 \checkmark$$

OR/OF

$$\text{gradient} = \frac{0,36 - 0}{0,3 - 0} \checkmark = 1,2 \checkmark$$

If the origin is used and zeros are not shown, max ²/₃*Indien die oorsprong gebruik word en nulwaardes word nie getoon, maks ²/₃*

(3)

3.5

POSITIVE MARKING FROM QUESTION 3.4
POSITIEWE NASIEN VANAF VRAAG 3.4

$$\text{Gradient} = \frac{a}{F} = \frac{1}{m}$$

$$m = \frac{1}{1,21} \checkmark = 0,83 \text{ kg } \checkmark$$

(2)

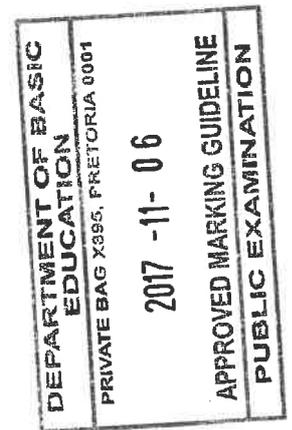
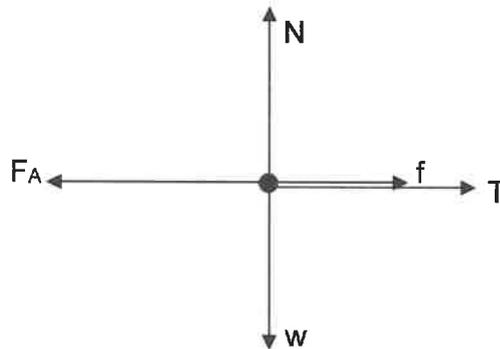
[13]

QUESTION/VRAAG 4

4.1 Frictional force is the force that opposes the motion of an object and which acts parallel to the surface. ✓✓
Wrywingskrag is die krag wat die beweging van 'n voorwerp teenstaan en ewewydig aan die oppervlak inwerk. ✓✓ (2)

4.2 (−) Newton's Third law: ✓
▶ When object A exerts a force on object B, object B simultaneously exerts an oppositely directed force of equal magnitude on object A. ✓✓
(−) *Newton se Derde wet: ✓*
▶ *Wanneer voorwerp A 'n krag op voorwerp B uitoefen sal voorwerp B gelyktydig 'n krag van gelyke grootte in die teenoorgestelde rigting op voorwerp A uitoefen. ✓✓* (3)

4.3



(5)

Notes: Accepted Labels/Aanvaarbare Byskrifte	Mark/Punt
w weight/gravitational force/ $F_G/F_g/12\ 740\ \text{N}$ <i>gewig/gravitasiekrag/swaartekrag/$F_G/F_g/12\ 740\ \text{N}$</i>	✓
T Tension force / F_T <i>Spanningskrag/F_T</i>	✓
f friction/ F_f <i>Wrywing/F_f</i>	✓
N Normal/ $F_N/12\ 740\ \text{N}$ <i>Normaal/$F_N/12\ 740\ \text{N}$</i>	✓
F_A Applied force/ $F_{\text{applied}}/F_{\text{engine}}/F$ <i>Toegepaste krag/$F_{\text{toegepas}}/F_{\text{engin}}/F$</i>	✓
Any additional force: deduct 1 mark (maximum $4/5$) <i>Enige addisionele krag: trek 1 punt af (maksimum $4/5$)</i>	
Lines must touch object otherwise (maximum $4/5$) <i>Lyne moet voorwerp raak anders (maksimum $4/5$)</i>	
Subtract one mark if arrows are not shown <i>Trek een punt af indien pylpunte nie gewys word nie</i>	

4.4 4.4.1 $F_{\text{net}} = ma$ } ✓
 $F_{\text{engine}} - f - T = 0$
 $9\ 000 - 0,45(F_g) - T = 0$
 $9\ 000 \checkmark - 0,45(1\ 300)(9,8) \checkmark - T = 0 \checkmark$
 $T = 3\ 267\ \text{N} \checkmark$ (5)

MC

4.4.2 **POSITIVE MARKING FROM QUESTION 4.4.1****POSITIEWE NASIEN VANAF VRAAG 4.4.1**

$$\left. \begin{array}{l} F_{\text{net}} = ma \\ F_{\text{net}} = 0 \\ T - f_k = 0 \end{array} \right\} \checkmark \text{ Any one / enige een}$$

$$3\,267 - f_k = 0 \checkmark$$

$$f_k = 3\,267 \text{ N (backwards/terugwaarts)}$$

$$f_k = \mu_k N \checkmark$$

$$f_k = \mu_k mg$$

$$3\,267 = \mu_k(950)(9,8) \checkmark$$

$$\mu_k = 0,35 \checkmark$$

OR

$$f_k = \mu_k N \checkmark$$

$$f_k = \mu_k mg$$

$$3\,267 \checkmark = \mu_k(950)(9,8) \checkmark$$

$$\mu_k = 0,35 \checkmark$$

(5)

- 4.5 Newton's second law \checkmark the object experiences a net force slowing it down to stop $\checkmark\checkmark$

OR

Newton's first law, \checkmark an object will continue moving at a constant velocity unless a non-zero net force acts on it. $\checkmark\checkmark$

Newton se tweede wet \checkmark die voorwerp ervaar 'n netto krag wat dit laat stadiger beweeg totdat dit stop. $\checkmark\checkmark$

OF

Newton se eerste wet, \checkmark sal 'n voorwerp aanhou beweeg teen 'n konstante snelheid tensy 'n nie-nul netto krag daarop inwerk. $\checkmark\checkmark$

(3)

4.6 **POSITIVE MARKING FROM QUESTION 4.4.1****POSITIEWE NASIEN VANAF VRAAG 4.4.1**

$$F_{\text{net}} = ma$$

$$-3\,267 = 950a \checkmark$$

$$a = -3,44 \text{ m}\cdot\text{s}^{-2}$$

$$= 3,44 \text{ m}\cdot\text{s}^{-2} \checkmark \text{ backwards/to the right / terugwaarts/regs } \checkmark$$

(3)

[26]**QUESTION/VRAAG 5**

- 5.1 Weight is the gravitational force exerted on an object by the earth. \checkmark

Gewig is die gravitasiekrag wat die Aarde op 'n voorwerp uitoefen. \checkmark

Mass is the amount of matter in a body. \checkmark

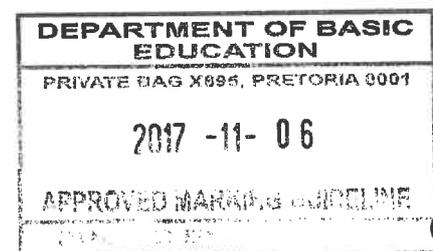
Massa is die hoeveelheid materie in 'n liggaam. \checkmark

(2)

5.2 $g = \frac{GM}{r^2} \checkmark$

$$2,7 = \frac{6,67 \times 10^{-11} M}{\left(\frac{1}{3} \times 6,38 \times 10^6\right)^2} \checkmark$$

$$M = 1,83 \times 10^{23} \text{ kg } \checkmark$$



(4)

- 5.3 $\frac{9,8}{2,7} = 3,63 \text{ times smaller } \checkmark\checkmark \text{ on planet X than on Earth}$

3,63 keer kleiner op planeet X as op die Aarde

(2)

[8]

MC

QUESTION/VRAAG 6

6.1 Angle of incidence is the angle between the normal to a reflecting surface and incident ray. ✓✓
Invalshoek is die hoek tussen die normaal op die oppervlak en die invallende straal. ✓✓ (2)

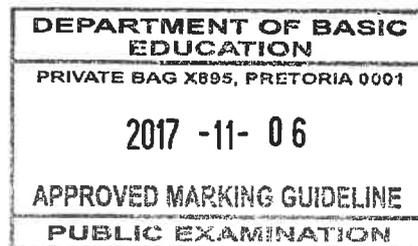
<p>6.2 OPTION 1/OPSIE 1</p> $\text{gradient} = \frac{0,37 - 0}{0,56 - 0} = 0,66 \checkmark$ $\text{gradient} = \frac{\sin \theta_r}{\sin \theta_i} = \frac{n_i}{n_r}$ $\text{gradient} = \frac{1}{n_r}$ $n_r = \frac{1}{0,66} \checkmark$ $n_r = 1,51 \checkmark$	<p>OPTION 2/OPSIE 2</p> $n_i \sin \theta_i = n_r \sin \theta_r \checkmark$ $1(0,56) = n_r (0,37) \checkmark$ $n_r = 1,51 \checkmark$
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6.3 **POSITIVE MARKING FROM QUESTION 6.2**
POSITIEWE NASIEN VANAF VRAAG 6.2

$$n = \frac{c}{v} \checkmark$$

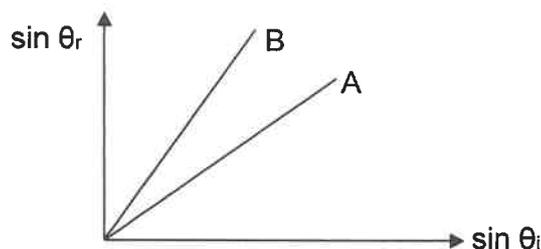
$$1,51 = \frac{3 \times 10^8}{v} \checkmark$$

$$v = 1,99 \times 10^8 \text{ m}\cdot\text{s}^{-1} \checkmark$$



6.4.1 $n_i \sin \theta_i = n_r \sin \theta_r \checkmark$
 $1 \sin 40^\circ \checkmark = n_r \sin 31^\circ \checkmark$
 $n_r = 1,25 \checkmark$

6.4.2



Criteria/Kriteria:

The gradient of B must be bigger than the gradient of A. ✓✓

Die helling van B moet groter wees as die helling van A. ✓✓ (2)

6.5.1 Angle of incidence should be between 49° and 90°. ✓✓
Invalshoeke tussen 49° en 90°. ✓✓

OR/OF

$$49^\circ < \theta < 90^\circ. \quad (2)$$

6.5.2 Light must travel from optically denser medium (higher refractive index) to an optically less dense medium (lower refractive index). ✓✓
Lig moet beweeg vanaf 'n medium met hoë optiese digtheid (hoë brekingsindeks) na 'n medium met lae optiese digtheid (lae brekingsindeks) ✓✓ (2)

[18]

QUESTION/VRAAG 7

7.1	Criteria for investigative question:/Kriteria vir ondersoekende vraag	
	The dependent and independent variables are stated correctly. <i>Die afhanklike en onafhanklike veranderlikes korrek genoem.</i>	✓
	State the relationship between the dependent and independent variables. <i>Stel die verwantskap tussen die afhanklike en onafhanklike veranderlike.</i>	✓
	Dependent variable/afhanklike veranderlike: degree of diffraction/ <i>mate van diffraksie</i> Independent variable/onafhanklike veranderlike: slit width/ <i>spleetwydte</i>	

Examples:/Voorbeelde:

What is the relationship between slit width and degree of diffraction?

Wat is die verhouding tussen spleetwydte en mate van diffraksie?

OR/OF

How does the width of the central bright band change as the slit width changes?

Hoe word die breedte van die sentrale helder band beïnvloed deur die verandering in spleetwydte?

(2)

7.2 Every point of a wave front serves as a point source of spherical, secondary waves that move forward with the same speed as the wave. ✓✓

Elke punt van 'n golffront dien as 'n puntbron van sferiese, sekondêre golwe wat voortwaarts beweeg teen dieselfde spoed as die golf. ✓✓

(2)

7.3 Decrease ✓

Neem af ✓

(1)

7.4 The degree/amount of diffraction is inversely proportional to the slit width. ✓✓

OR Degree of diffraction $\propto 1/w$

Die mate van diffraksie is omgekeerd eweredig aan die spleetwydte. ✓✓

OF *Mate van diffraksie* $\propto 1/w$

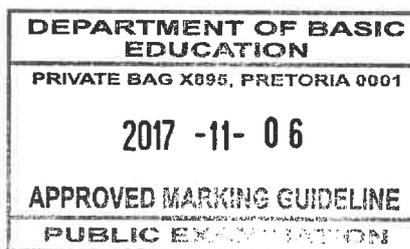
(2)

7.5 Increase ✓

Toeneem ✓

(1)

[8]



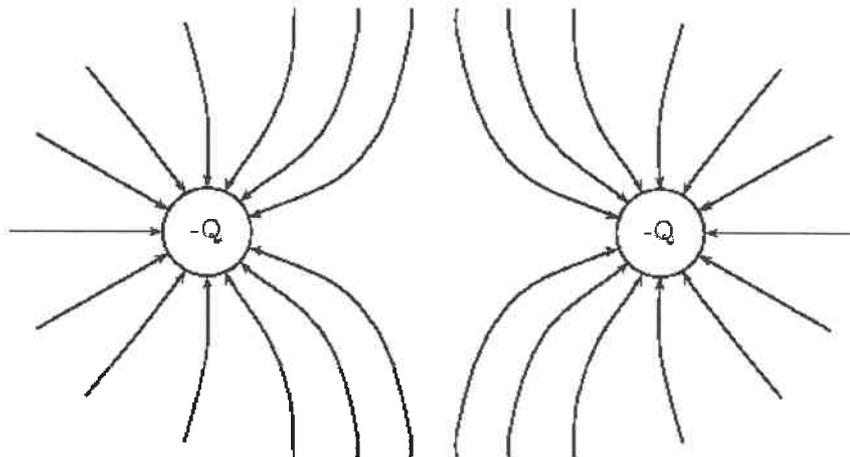
ME

QUESTION/VRAAG 8

8.1 The electrostatic force experienced per unit positive charge (placed at that point) ✓✓
 Die elektrostatiese krag wat per eenheid positiewe lading (ondervind word by daardie punt) ✓✓ (2)

8.2 Negative ✓
 Negatief ✓ (1)

8.3 **POSITIVE MARKING FROM QUESTION 8.2**
POSITIEWE NASIEN VANAF VRAAG 8.2



Criteria for marking/Nasienkriteria	
Shape of the field Vorm van veld	✓
Direction of the field Rigting van veld	✓
Lines touch charge/line don't cross etc. Lyne raak lading/lyne kruis nie ens.	✓

NOTE: If only one charge is drawn, no marks
 NOTA: Indien slegs een lading geteken word, geen punte

(3)

8.4 $E = \frac{kQ}{r^2}$ } ✓ Any one/lenige een
 $E_{net} = \frac{kQ}{r^2} + \frac{kQ}{r^2}$
 $5,44 \times 10^6 \checkmark = \frac{9 \times 10^9 Q}{(5 \times 10^{-3})^2} \checkmark + \frac{9 \times 10^9 Q}{(3 \times 10^{-3})^2} \checkmark$
 $Q = 4 \times 10^{-9} \text{ C} \checkmark$

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(5)

8.5 Net electric field DECREASES ✓
 The positive charge on X will have a field in the opposite direction. The electric field (strength) being a vector will decrease because of opposite directions. ✓
 Netto elektriese veld NEEM AF ✓
 Die positiewe lading op X het 'n veld in die teenoorgestelde rigting. Die elektriese veld (sterkte) is 'n vektor en dit sal die veld laat afneem as die rigtings van die twee ladings se velde teenoorgesteld is. ✓

(2)
[13]

QUESTION/VRAAG 9

9.1 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 geïnduseerde emk oor die ente van 'n geleier is direk eweredig aan die tempo van verandering van die magnetiese vloedkoppeling met die geleier. ✓✓

(2)

9.2 Accept any correct combination of coordinates from the graph for example:

($1/\Delta t$; ϵ) can be (1,8 ; 3) OR (1,2 ; 2) OR (0,6 ; 1)

Aanvaar enige korrekte kombinasie van koördinate vanaf die grafiek

byvoorbeeld: ($1/\Delta t$; ϵ) kan wees (1,8 ; 3) OF (1,2 ; 2) OF (0,6 ; 1)

<p>OPTION 1/OPSIE 1 $\epsilon = \frac{-N\Delta\Phi}{\Delta t}$ ✓ $3 \checkmark = -(200) \checkmark \Delta\Phi(1,8)$ ✓ $\Delta\Phi = -0,0083 \text{ Wb}$ ✓</p>	<p>OPTION 2/OPSIE 2 $\epsilon = \frac{-N\Delta\Phi}{\Delta t}$ ✓ $3 \checkmark = -(200) \checkmark \Delta\Phi\left(\frac{1}{0,56}\right)$ ✓ $\Delta\Phi = -0,0083 \text{ Wb}$ ✓</p>
<p>OPTION 3/OPSIE 3 gradient = $\epsilon\Delta t = -N\Delta\Phi$ ✓ $3 \checkmark(0,56)$ ✓ = $-(200) \checkmark \Delta\Phi$ $\Delta\Phi = -0,0083 \text{ Wb}$ ✓</p>	

(5)

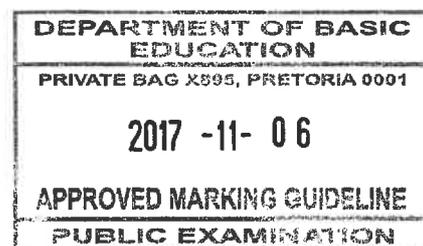
9.3 **POSITIVE MARKING FROM 9.2**
POSITIEWE NASIEN VANAF VRAAG 9.2

$\Delta\Phi = \Phi_f - \Phi_i$ ✓

$-0,0083 \checkmark = (4,86 \times 10^{-3})(2,4) \cos 90^\circ - (4,86 \times 10^{-3})(2,4) \cos \theta$ ✓

$\theta = 44,64^\circ$ ✓

(4)
[11]



Handwritten marks/signatures

QUESTION/VRAAG 10

- 10.1.1 Power is the rate at which work is done/energy is transferred. ✓✓
Drywing is die tempo waarteen arbeid verrig /energie oorgedra word ✓✓ (2)

10.1.2	OPTION 1/OPSIE 1 $\frac{1}{R_{//}} = \frac{1}{R_1} + \frac{1}{R_2}$ $\frac{1}{R_{//}} = \frac{1}{6} + \frac{1}{15} \checkmark$ $R_{//} = 4,29 \Omega \checkmark$	OPTION 2/OPSIE 2 $R_{//} = \frac{R_1 \times R_2}{R_1 + R_2}$ $R_{//} = \frac{6 \times 15}{6 + 15} \checkmark$ $R_{//} = 4,29 \Omega \checkmark$	(2)
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- 10.1.3 **POSITIVE MARKING FROM QUESTION 10.1.2**
POSITIEWE NASIEN VANAF VRAAG 10.1.2

$$P = \frac{V^2}{R} \checkmark$$

$$50 = \frac{V^2}{4,29} \checkmark$$

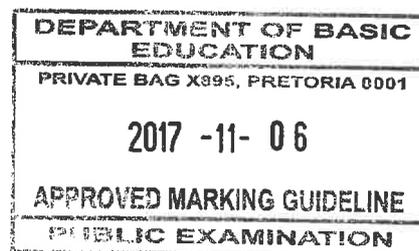
$$V = 14,65 \text{ V} \checkmark$$

(3)

- 10.1.4 **POSITIVE MARKING FROM QUESTION 10.1.2 and 10.1.3**
POSITIEWE NASIEN VANAF VRAAG 10.1.2 en 10.1.3

OPTION 1/OPSIE 1 $R = \frac{V}{I} \checkmark$ $4,29 = \frac{14,65}{I} \checkmark$ $I = 3,41 \text{ A} \checkmark$	OPTION 2/OPSIE 2 $P = VI \checkmark$ $50 = (14,65)I \checkmark$ $I = 3,41 \text{ A} \checkmark$
OPTION 3/OPSIE 3 $P = I^2R \checkmark$ $50 = I^2(4,29) \checkmark$ $I = 3,41 \text{ A} \checkmark$	OPTION 4/OPSIE 4 $V = IR \checkmark$ $14,65 = I(6)$ $I = 2,44 \text{ A}$ $V = IR$ $14,65 = I(15)$ $I = 0,98 \text{ A}$ $2,44 + 0,98 \checkmark = 3,42 \text{ A} \checkmark$

(3)



10.1.5 Decreases ✓

Neem af ✓

(1)



10.1.6 The total resistance increases ✓

The current in the circuit decreases ✓

The resistance of R is constant, ✓ then the potential difference across R decreases.

*Totale weerstand neem toe ✓**Die stroom in die stroombaan neem af ✓**Die weerstand van R is konstant ✓ so die potensiaalverskil oor resistor R sal afneem*

(3)

10.2.1

$$P = \frac{W}{\Delta t} \checkmark$$

$$2\,000 \checkmark = \frac{W}{18\,000} \checkmark$$

$$W = 3,6 \times 10^7 \text{ J } \checkmark$$

(4)

10.2.2 Cost = price x unit kWh / *Koste = prys x eenheid kWh*

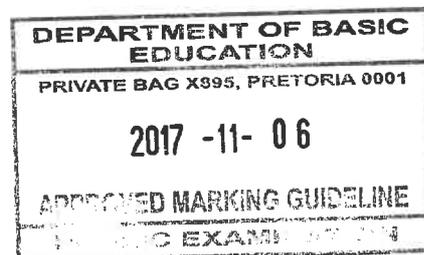
$$\text{Cost} = 80(2)(5)(30) \checkmark$$

$$\text{Cost} = 24\,000 \text{ cents} = \text{R}240 \checkmark$$

(answer can be given in rand or cents)

(antwoord kan in rand of sent gegee word)

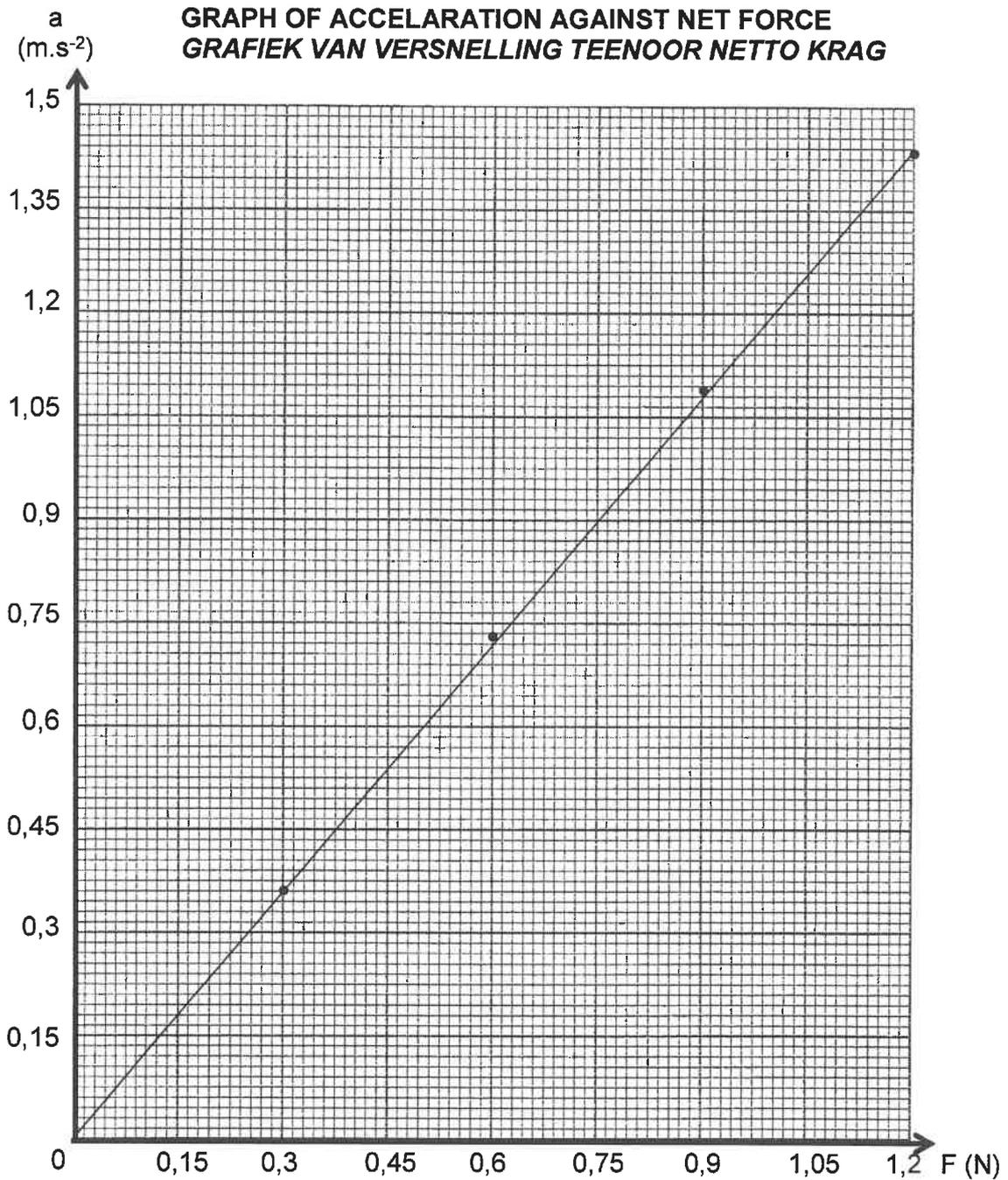
(2)

[20]

ANSWER SHEET/ANTWOORDBLAD

NAME/NAAM: _____ **CLASS/KLAS:** _____

QUESTION/VRAAG 3.3



TOTAL/TOTAAL: 150

