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Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIORSERTIFIKAAT*

GRADE/*GRAAD* 11

NOVEMBER 2024

PHYSICAL SCIENCES P1/ *FISIESE WETENSKAPPE V1* MARKING GUIDELINE/*NASIENRIGLYN*

MARKS/*PUNTE*: **150**

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This marking guideline consists of 12 pages./
Hierdie nasienriglyn bestaan uit 12 bladsye.

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QUESTION/*VRAAG* 1: MULTIPLE-CHOICE QUESTIONS/
MEERVOUDIGEKEUSE-VRAE

1.1	D ✓✓	(2)
1.2	C ✓✓	(2)
1.3	B ✓✓	(2)
1.4	C ✓✓	(2)
1.5	C ✓✓	(2)
1.6	A ✓✓	(2)
1.7	B ✓✓	(2)
1.8	A ✓✓	(2)
1.9	A ✓✓	(2)
1.10	C ✓✓	(2)

[20]

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QUESTION/*VRAAG 2*

2.1 Forces are in equilibrium when the net force acting at the point is equal to zero. ✓✓

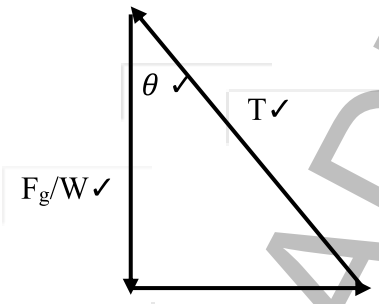
Kragte is in ewewig wanneer die netto kragte wat op 'n punt inwerk gelyk is aan nul.

OR/*OF*

It means the forces are balanced and the object will remain stationary/ moving at a constant velocity. ✓✓

Dit beteken dat die kragte gebalanseerd is en die voorwerp bly in rus / beweeg teen 'n konstante snelheid. (2)

2.2



T : Tension / *Spanning*

F_A : Applied Force / *Toegepaste krag*

F_g/W : Weight / *Gewig* **OR/*OF*** Gravitational Force / *Gravitasiekrag* (4)

2.3 2.3.1 $T^2 = F_A^2 + F_g^2$ (Pythagoras Theorem/*Stelling*)

$= [60^2 + \underline{(8 \times 9{,}8)^2}$ ✓] ✓

$= 9746{,}56$

$T = 98{,}72$ N ✓ (3)

2.3.2 **OPTION 1 / *OPSIE 1***

$\sin\theta = \frac{F_A}{T}$ ✓

$= \frac{60}{98{,}72}$ ✓

$\theta = 37{,}43°$ ✓

OPTION 2 / *OPSIE 2*

$\tan\theta = \frac{F_A}{W}$ ✓

$= \frac{60}{78{,}4}$ ✓

$\theta = 37{,}43°$ ✓ (3)

2.4 $F_R = 0$ ✓✓ (2)

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QUESTION/*VRAAG 3*

3.1 It is a single force having the same effect as the sum of the forces acting together. ✓✓

Dit is 'n enkele krag wat dieselfde effek het as die som van kragte wat saamwerk.

OR/*OF*

The vector sum of two or more vectors. ✓✓

The vektor som van twee of meer kragte. (2)

3.2 3.2.1 $f_k = \mu_k \cdot N$ ✓

$f_k = [0,33[2 \times 9,8 - (\mathbf{8,26}\sin 20^o)$ ✓] ✓

$f_k = 5,54$ N ✓ (4)

3.2.2 **POSITIVE MARKING FROM QUESTION 3.2.1 / *POSITIEWE NASIEN VANAF VRAAG 3.2.1***

$F_{net} = ma$

$F\cos\theta - T - f = ma$

$T - f = ma$

$[\mathbf{8,26}\cos 20°$ ✓$- T - 5,54 = 0]$ ✓

$T = 2,22$ N

$T = f$ (for block A/ vir blok A)

$f_k = \mu_k \cdot N$

$2,22$ ✓ $= \mu_k(1,5 \times 9,8)$ ✓

$\mu_k = 0,25$ ✓ (6)

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QUESTION/*VRAAG 4*

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

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

4.2 There is air friction on the container downwards. ✓✓

Daar is lugweerstand op die houer afwaarts.

There is an extra downward force ✓✓/ *Daar is 'n ekstra afwaartse krag* (2)

4.3 W = mg ✓

1960 = m 9,8 ✓

m = 200 kg ✓ (3)

4.4 **POSITIVE MARKING FROM QUESTION 4.3 / *POSITIEWE NASIEN VANAF VRAAG 4.3***

F_{net} = ma

T – F_g – F_{Fair} = ma ✓

T – 1960 – 140 ✓ = (200)(0,13) ✓ = 26

T = 2126 N ✓ (4)

4.5 2 100 N ✓ (1)

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QUESTION/*VRAAG 5*

5.1 When a net force is applied to an object, the object accelerates in the direction of the net force. The acceleration is directly proportional to the (net) 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.

OR/*OF*

The acceleration is directly proportional to the net force ✓ and inversely proportional to the mass ✓ of the object.

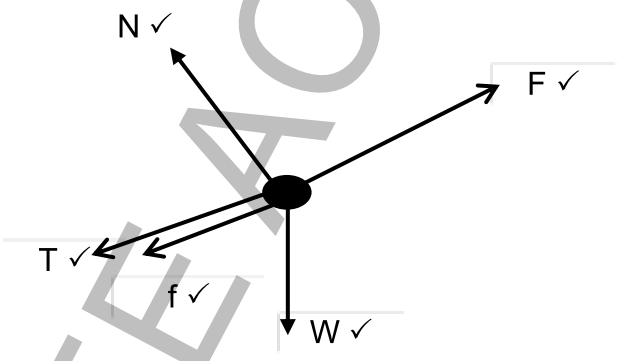
Die versnelling is direk eweredig aan die krag en omgekeerd eweredig aan die massa van die voorwerp.

OR/*OF*

The net force is equal to the rate of change of momentum, the net force and change in momentum are in the same direction. ✓✓ **(2 or 0)**

Die netto krag is gelyk aan die tempo van verandering van momentum, die netto krag en verandering in momentum is in dieselfde rigting. ***(2 of 0)*** (2)

5.2



(5)

5.3 $F_{net} = ma$ ✓

$F - F_{g//} - T - f = ma$ } Any one / *Enige een* ✓

$T - F_{g//} - f = ma$

$T - (1 \times 9{,}8 \sin 30^o) - 1 = a$…….. 1 ✓

$\underline{20 - (2 \times 9{,}8 \sin 30^o - T - 2}$ ✓ $= 2a$ …..2 ✓

$a = 2{,}15\ m.s^{-2}$ ✓

Formula
Calculating F_g for both blocks *Bereken F_g vir beide blokke*
Substituting for 1 kg block *Vervang vir 1 kg-blok*
Substituting for 2 kg block *Vervang vir 2 kg-blok*
Substituting for both 2a and a *Vervang vir beide 2a en a*
Answer/ *Antwoord*

(6)
[13]

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QUESTION/*VRAAG 6*

6.1 Every particle in the universe attracts every other particle with a 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 hulle middelpunte. (2)

6.2 $F = \frac{Gm_1m_2}{r^2}$ ✓

$F = \frac{(6,67 \times 10^{-11})(5,98 \times 10^{24})(4600)}{(6,38 \times 10^6 + 28 \times 10^6)^2}$ ✓ ✓

$F = 1552,29$ N ✓ (4)

6.3 Weightlessness is the sensation experienced when all contact forces are removed. ✓✓ /
Gewigloosheid is 'n sensasie ervaar wanneer al die kontakkragte verwyder is. (2)

6.4 **OPTION 1 / *OPSIE 1***
Greater than. ✓ The mass is greater ✓ and for the same force ✓ the distance must also be greater. ✓
Groter as. Die massa is groter en vir dieselfde krag moet die afstand groter wees.

OPTION 2
Greater than / *Groter as* ✓

$F = \frac{Gm_1m_2}{r^2}$

$1552,29 = \frac{(6,67 \times 10^{-11})(5,98 \times 10^{24})(5300)}{R^2}$ ✓

$R = 3,69 \times 10^7$ m

Distance above the surface of the earth / *Die afstand bokant die oppervlakte van die aarde*

$D = 3,69 \times 10^7 - 6,38 \times 10^6$ ✓

$= 3,05 \times 10^7$ m ✓ (or/*of* 30520000 m) (4)

[12]

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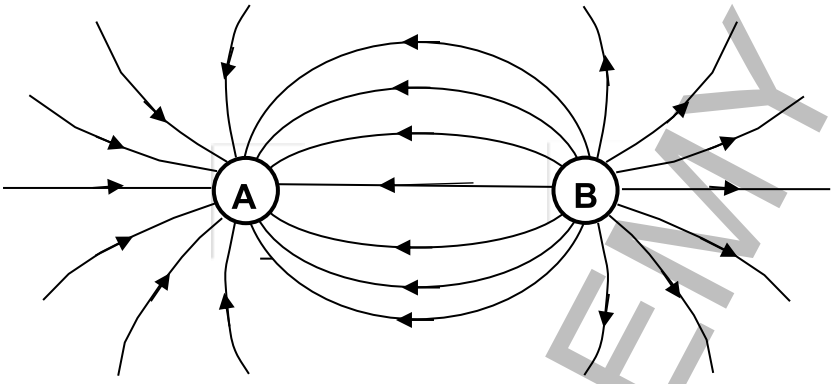
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QUESTION/*VRAAG 7*

7.1 Electric field at a point is the electrostatic force experienced per unit positive charge placed at that point. ✓✓

Die elektriese veld by 'n punt is die elektrostatiese krag ondervind per eenheid positiewe lading wat by daardie punt geplaas is. (2)

7.2



CRITERIA FOR MARKING / *NASIENKRITERIA*	
Correct shape / *Korrekte vorm*	✓
Correct field direction / *Korrekte veldrigting*	✓
Lines starting from sphere and not crossing each other *Lyne begin vanaf die sfeer en kruis nie mekaar nie*	✓

(3)

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7.3 $E_1 = \frac{kQ}{r^2}$ ✓

$E_1 = \frac{9 \times 10^9 (15 \times 10^{-9})}{(2 \times 10^{-2})^2}$ ✓ ✓

$E_1 = 337\,500$ N.C^{-1} to the left / *na links*

$E_2 = \frac{9 \times 10^9 Q}{(8 \times 10^{-2})^2}$ ✓ ✓

$E_2 = 1{,}40625 \times 10^{12} \times Q_x$ to the left / *na links*

$E_{net} = E_1 + E_2$

$3{,}943 \times 10^5$ ✓ $= 337\,500 + 1{,}40625 \times 10^{12} Q_{Xn}$ ✓

$Q_X = (+)4{,}04 \times 10^{-8}$ C ✓ (8)

7.4 Decrease / *Afneem* ✓ (1)

7.5.1 The electrostatic force of attraction or repulsion between two charges is directly proportional to the product of the charges ✓ and inversely proportional to the square of the distance between them. ✓

Die elektrostatiese krag van afstoting of aantrekking wat deur twee puntladings op mekaar uitoefen word, is direk eweredig aan die produk van die grootte van die ladings en omgekeerd eweredig aan die kwadraat van die afstand tussen hulle. (2)

7.5.2 $F = \frac{kQ_1Q_2}{r^2}$ ✓

$F_A = \frac{(9 \times 10^9)(100 \times 10^{-6})^2}{(0{,}06)^2}$ ✓ ✓

$F_A = 25\,000$ N to the right / *na regs*

$F_B = \frac{(9 \times 10^9)(100 \times 10^{-6})^2}{(0{,}03)^2}$ ✓ ✓

$F_B = 100\,000$ N to the right/ *na regs*

$F_{net} = F_A + F_B$
$= 25\,000 + 100\,000$ ✓
$= 125\,000$ N to the right / *na regs* ✓ (7)

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QUESTION/*VRAAG 8*

8.1 $\Phi = BA\cos\theta$ ✓

$= 3,2\ (\pi 0,04^2)$ ✓ $\cos 0°$ ✓

$= 0,016$ Wb ✓ (or 0,02 Wb) (4)

8.2 $\varepsilon = \frac{-N\Delta\Phi}{\Delta t}$ ✓

28 ✓ $= - \frac{250\ (0,016\cos 25° - 0,016\cos 0°)}{\Delta t}$ ✓

$\Delta t = 0,13$ s ✓ (0,17 s if 0,02 Wb is used / 0,17 s as 0,02 Wb gebruik is) (4)

8.3 Faraday's Law. ✓ The magnitude of the induced emf across the end of a conductor is directly proportional to the rate of change in the magnetic flux linkage with the conductor. ✓✓

Faraday se wet. 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. (3)

8.4 8.4.1 Smaller than / *Kleiner as* ✓ (1)

8.4.2 The area of a square is smaller than the area of a circle with the radius equal to the side length of the square. ✓✓

Die oppervlak van 'n vierkant is kleiner as die oppervlak van 'n sirkel met die radius gelyk aan die lengte van die sye van 'n vierkant.

OR/*OF*

$0,04^2 < \pi \times 0,04^2$ area of square is smaller than area of circle ✓✓ / *oppervlakte van 'n vierkant is kleiner as die oppervlak van 'n sirkel.*

OR/*OF*

ε directly proportional to / *direk eweredig aan* A ✓✓ (2)

[14]

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QUESTION/*VRAAG 9*

9.1 The maximum energy per coulomb of charge supplied by the battery. ✓✓

Die maksimum energie per coulomb lading wat deur 'n battery verskaf word. (2)

9.2 $\frac{1}{R_p}=\frac{1}{R_1}+\frac{1}{R_2}$ ✓

$\frac{1}{R_p}=\frac{1}{8}+\frac{1}{9+15}$ ✓ ✓

$R_p = 6\ \Omega$

$R_{ext} = 6 + 3$ ✓

$R_{ext} = 9\ \Omega$

emf = I(R + r) ✓

12 = I(9 + 0,6) ✓

I = 1,25 A ✓ (7)

9.3 V = IR ✓

V = (1,25)(9) ✓

V = 11,25 V ✓ (3)

9.4 Increase / *Toeneem* ✓ (1)

9.5 Total external resistance increases / *Totale eksterne weerstand neem toe* ✓

Total current decreases / *Totale stroom neem af* ✓

Lost volts decreases/ *Verlore volts neem af* ✓ (3)

9.6 $W = \frac{V^2\Delta t}{R}$ ✓

$= \left[\frac{240^2 \times [30 \times 60]}{48}\right]$ ✓ ✓

= 2160 000 J

Cost /koste = $\frac{2160\ 000}{(3600 \times 1000)} \times 2{,}56$ ✓

= R 0,882 ✓ (5)

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QUESTION/*VRAAG 10*

10.1 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 deur die geleier by konstante temperatuur.

OR/*OF*

The ratio of potential difference to the current is a constant provided the temperature remains constant. ✓✓

Die verhouding van potensiaalverskil tot die stroom is konstant mits die temperatuur konstant bly. (2)

10.2 Inverse of resistance / *Omgekeerde van weerstand* ✓ **OR/*OF*** 1/R ✓ (1)

10.3 Y ✓ The inverse of the gradient of graph Y is greater / *Die omgekeerde van die helling van grafiek Y is groter* ✓

OR/*OF*

Gradient of graph Y smaller /
Helling van grafiek Y is kleiner. ✓

Thus /*daarom* 1/R smaller / *kleiner* ✓

OR /*OF*

Hence/ *daarom*, R is greater/ *is groter.* ✓ (2)

10.4 **OPTION 1 / *OPSIE 1***

R_X = inverse of gradient / *omgekeerde helling*

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

$$m = \frac{0,4 - 0,2}{8 - 4} \checkmark \checkmark$$

$$m = 0,05$$

$$R_x = \frac{1}{0,05} \checkmark$$

$R_x = 20\ \Omega$ ✓

OPTION 1 / *OPSIE 2*

$$R = \frac{V}{I} \checkmark$$

$$R = \frac{6}{0,3} \checkmark$$

$R = 20\ \Omega$ ✓ (4)

(Any other correct values from graph / *Enige ander korrekte waardes vanaf die grafiek*) **[9]**

TOTAL/*TOTAAL*: 150

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