Province of the
EASTERN CAPE
EDUCATION

NATIONAL/*NASIONALE*
SENIOR
CERTIFICATE/*SERTIFIKAAT*

GRADE/*GRAAD* 11

NOVEMBER 2020

PHYSICAL SCIENCES P1/ *FISIESE WETENSKAPPE V1* MARKING GUIDELINE/*NASIENRIGLYN* *(EXEMPLAR/EKSEMPLAAR)*

MARKS/*PUNTE*: 150

This marking guideline consists of 10 pages.
Hierdie nasienriglyn bestaan uit 10 bladsye.

QUESTION 1/*VRAAG 1*

1.1 C ✓✓ (2)

1.2 B ✓✓ (2)

1.3 A ✓✓ (2)

1.4 A ✓✓ (2)

1.5 D ✓✓ (2)

1.6 C ✓✓ (2)

1.7 D ✓✓ (2)

1.8 B ✓✓ (2)

1.9 D ✓✓ (2)

1.10 B ✓✓ (2)

[20]

QUESTION 2/*VRAAG 2*

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

OR/*OF*

A single vector having the same effect as two or more vectors acting together. ✓✓
'n Enkele vektor wat dieselfde effek het as twee of meer vektore wat saam inwerk. (2)

2.2 2.2.1

OPTION 1/ *OPSIE 1*	**OPTION 2/ *OPSIE 2***
$T_{2X} = T\cos\theta$	$T_{2X} = T\sin\theta$
$T_{2X} = 245 \cos 30^o$ ✓	$T_{2X} = 245 \sin 60^o$ ✓
$T_{2X} = 212{,}18$ N ✓	$T_{2X} = 212{,}18$ N ✓
$T_{2Y} = T\sin\theta$	$T_{2Y} = T\cos\theta$
$T_{2Y} = 245 \sin 30^o$ ✓	$T_{2Y} = 245 \cos 60^o$ ✓
$T_{2Y} = 122{,}5$ N ✓	$T_{2Y} = 122{,}5$ N ✓

(4)

2.2.2 $T_1 = T_{2X}$ ✓
$T_1 = 212{,}18$ N ✓ (2)

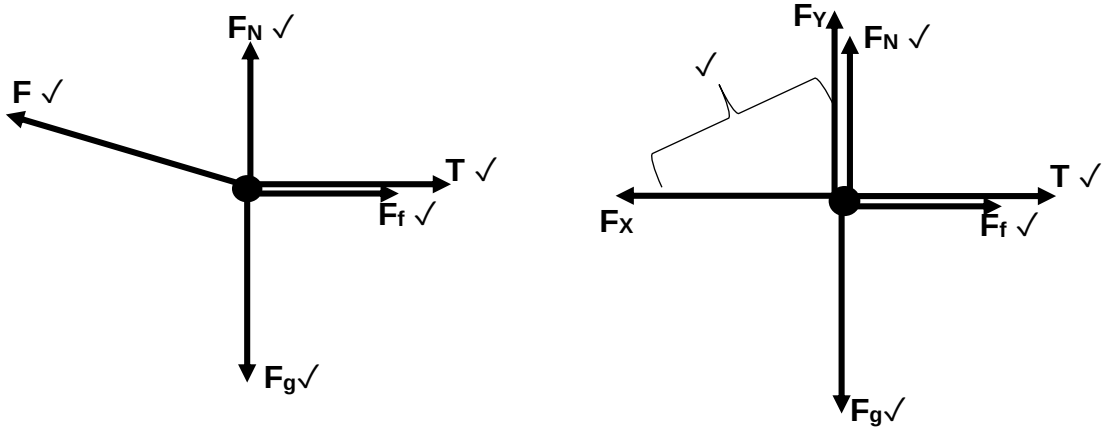
2.2.3 $W = T_{2Y}$
$W = 122{,}5$ N
$W = mg$
Any one/*Enige een* ✓
$122{,}5 = m \times 9{,}8$ ✓
$m = 12{,}5$ kg ✓ (3)

[11]

QUESTION 3/*VRAAG 3*

3.1 The force that opposes the motion of a moving object relative to the surface. ✓✓
Die krag wat die beweging van 'n bewegende voorwerp relatief tot die oppervlak teenwerk. (2)

3.2 **OPTION 1/*OPSIE 1*** **OPTION 2/*OPSIE 2***



Mark awarded for arrow and label./ *Punt toegeken vir byskrif en pyltjie.*
Do not penalise for length of arrows since drawing is not drawn to scale./ *Moenie vir die lengte van die pyltjie penaliseer nie aangesien diagram nie volgens skaal geteken is nie.*
Any other additional force(s)./ *Enige ander addisionele krag(te).* $^{4}/_{5}$
If force(s) do not make contact with body. / *As krag(te) nie kontak met die voorwerp maak nie.* Max./ *Maks.* $^{4}/_{5}$ (5)

3.3 3.3.1

OPTION 1/*OPSIE 1*	**OPTION 2/*OPSIE 2***
$N = F_g - F \sin\theta$ ✓ $N = 25x\ 9,8 - 250 \sin 25^o$ ✓ $N = 139,35$ N ✓	$F_Y = F \sin\theta$ $= 250 \sin 25^\circ$ $= 105,66$ N $N = F_g - F_Y$ ✓ $N = 25x\ 9,8 - 105,66$ ✓ $N = 139,34$ N ✓

(3)

3.3.2 **POSITIVE MARKING FROM 3.1.1/*POSITIEWE NASIEN VANAF 3.1.1***

$F_{net} = ma$
$F_{net} = F\cos\theta - T - f$] Any one/*Enige een* ✓

$[250 \cos 25^\circ$ ✓ $- T - (0,15 \times 139,35)$ ✓] ✓ $= 25a$

$25a = 205,6744468 - T$ ...(1)

$F_{net} = T - F_g$

$T - 98$ ✓$= 10a$ . . . (2)

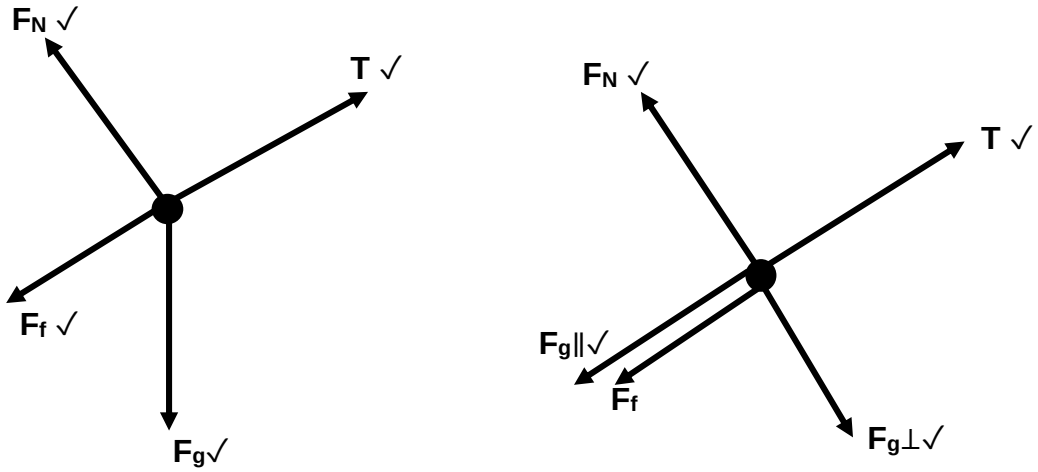
Any one of 25a or 10a/ *Enige een van 25a of 10a* ✓

Adding the two equations/*Tel die twee vergelykings bymekaar*:
$35a = 107,6744468$
$a = 3,08$ m.s^{-2} ✓ (7)
[17]

QUESTION 4/*VRAAG 4*

4.1 When a resultant force acts on an object, the object will accelerate in the direction of the force. The acceleration is directly proportional to the resultant force ✓ and inversely proportional to the mass ✓of the object.
Wanneer 'n resulterende krag op 'n voorwerp inwerk, sal die voorwerp in die rigting van die krag versnel. Die versnelling is direk eweredig aan die resulterende krag en omgekeerd eweredig aan die massa van die voorwerp. (2)

4.2



(4)

Mark awarded for arrow and label. / *Punt toegeken vir pyltjie en byskrif.*
Do not penalise for length of arrows since drawing is not drawn to scale./ *Moenie vir die lengte van die pyltjie penaliseer nie aangesien diagram nie volgens skaal geteken is nie.*
Any other additional force(s)./ *Enige ander addisionele krag(te).* $^3/_4$
If force(s) do not make contact with body. / *As krag(te) nie kontak maak met die voorwerp nie.* Max/ *Maks* $^3/_4$

4.3 4.3.1 $F_{net} = ma$
$F_{net} = T - F_{g//} - f$
$T - F_{g//} - f = ma$
$T - F_{g//} - f = 0$
Any one/*Enige een* ✓

$[T - (1,5 \times 9,8 \sin 20^o)$ ✓$- 2]$ ✓ $= 0$ ✓
$T = 7,03$ N ✓ (5)

4.3.2 $F_{net} = ma$
$F_{net} = F - T - F_{g//} - f$
$F - T - F_{g//} - f = ma$
$F - T - F_{g//} - f = 0$
Any one/ *Enige een* ✓

$[24 - 7,03 - (3,2 \times 9,8 \sin 20^o) - f_k] = 0$ ✓
$f_k = 6,22425$ N
$f_k = \mu_k N$ ✓
$[6,22425 = \mu_k \times 3,2 \times 9,8 \cos 20^o$✓$]$ ✓
$\mu_k = 0,21$ ✓ (6)
[17]

QUESTION 5/*VRAAG 5*

5.1 Every particle attracts every other particle in the universe 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 lok enige ander deeltjie in die heelal 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)

5.2 $F = \frac{GM_1M_2}{r^2}$ ✓

$F = \frac{6,67 \times 10^{-11} \times 5,98 \times 10^{24} \times 1000}{(6,38 \times 10^6 + 2 \times 10^5)^2}$ ✓✓

F = 9 212,45 N ✓ (5)

5.3

OPTION 1 / *OPSIE 1*	**OPTION 2 / *OPSIE 2***
W = mg ✓ W = 1 000 x 9,8 ✓ W = 9 800 N ✓	$W = \frac{GM_1M_2}{r^2}$ ✓ $W = \frac{6,67 \times 10^{-11} \times 1000 \times 5,98 \times 10^{24}}{(6,38 \times 10^6)^2}$ ✓ W = 9 799,09 N ✓

(3)

5.4 $W = \frac{900}{4}$ ✓ = 2 450 N ✓

When the distance doubles the force will decrease by a factor of 4 ✓.
Wanneer die afstand verdubbel, sal die krag vier (4) keer verminder. (3)
[13]

QUESTION 6/*VRAAG 6*

6.1 The ratio of the sine of the angle of incidence in one medium to the sine of the angle of refraction in the other medium is constant. ✓✓
Die verhouding tussen die sinus van die invalshoek in die een medium en die sinus van die brekingshoek in die ander medium is konstant. (2)

6.2 6.2.1 $\frac{n_2}{n_1} = \frac{\sin\theta_1}{\sin\theta_2}$ ✓

$\frac{1,52}{1}$ ✓ $= \frac{\sin 40^\circ}{\sin\theta_2}$ ✓

$\theta_2 = 25,02^\circ$ ✓ (4)

6.2.2 $n = \frac{c}{v}$ ✓

$1,52 = \frac{3 \times 10^8}{v}$ ✓

$v = 1,97 \times 10^8 \text{ m.s}^{-1}$ ✓ (3)

6.2.3 $\frac{n_2}{n_1} = \frac{\sin\theta_1}{\sin\theta_2}$ ✓

$\frac{1,52}{1} = \frac{\sin 90^\circ}{\sin\theta_2}$ ✓

$\theta_2 = 41,14^\circ$ ✓ (4)

6.3 A phenomenon that occurs when light travels from a denser medium to a less dense medium and the refracted ray does not emerge from the medium, but is reflected back into the medium. ✓✓

'n Verskynsel wat voorkom wanneer lig van 'n digter medium na 'n minder digte medium beweeg en die gebreekte straal nie uit die medium kom nie, maar weer terug in die medium weerkaats. (2)

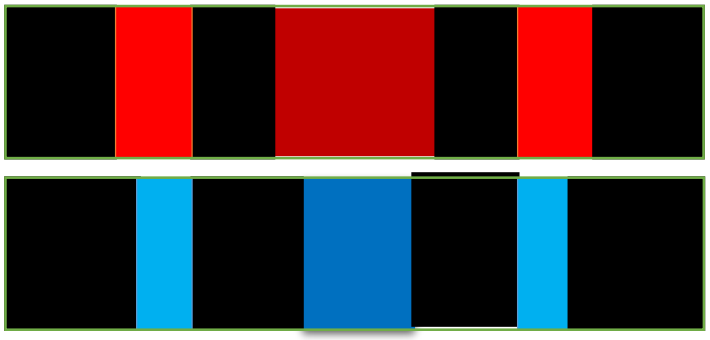
6.4 The light must travel from a denser medium to a less dense medium. ✓
The angle of incidence must be greater than the critical angle of the denser medium. ✓
Die lig moet van 'n digter medium na 'n minder digte medium beweeg.
Die invalshoek moet groter wees as die grenshoek van die digter medium. (2)

[17]

QUESTION 7/*VRAAG 7*

7.1 Diffraction/ *Diffraksie* ✓ (1)

7.2



✓✓

✓✓

(4)

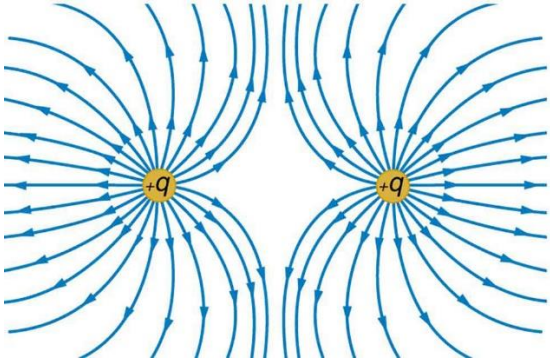
7.3 The coloured bands for red light are broader than those of blue light. ✓
The wavelength for red light is longer than that of a blue light. ✓
Die gekleurde bande vir rooi lig is breër as dié van blou lig.
Die golflengte vir rooi lig is langer as dié van blou lig. (2)

7.4 Light has a wave nature / *Lig het golf-aard* ✓ (1)

7.5 The coloured bands will become broader./ *Die gekleurde bande sal breër word.* ✓
The slit width is inversely proportional to the degree of diffraction. ✓✓
Die spleetwydte is omgekeerd eweredig aan die mate van diffraksie.
OR/*OF*
Smaller width gives broader diffraction./ *Kleiner breedte gee breër diffraksie*. ✓✓ (3)
[11]

QUESTION 8/*VRAAG 8*

8.1



CRITERIA FOR MARKING/ *KRITERIA VIR NASIEN*	
Correct shape/ *Korrekte vorm.*	✓
Direction of field lines./ *Rigting van veldlyne*	✓
Field lines not crossing each other./ *Veldlyne kruis nie mekaar nie.*	✓

(3)

8.2 $F=\frac{kQ_1Q_2}{r^2}$ ✓

$5{,}09$ ✓$=\frac{9\times10^{9}\times Q^{2}}{0{,}1^{2}}$ ✓

$Q = 2{,}38 \times 10^{-6}$ C ✓ (4)

8.3 $E = \frac{kQ}{r^2}$ ✓

$E_1=\frac{9\times10^{9}\times2{,}38\times10^{-6}}{0{,}15^{2}}$ ✓

$E_1 = 952\ 000$ NC^{-1} right / *regs*

$E_2=\frac{9\times10^{9}\times2{,}38\times10^{-6}}{0{,}05^{2}}$ ✓

$E_2 = 8\ 568\ 000$ NC^{-1} right / *regs*

$E_{net} = E_1 + E_2$

$E_{net} = 952\ 000 + 8\ 568\ 000$ ✓

$E_{net} = 9\ 520\ 000$ NC^{-1} right / *regs* ✓ (5)

8.4 $F = \frac{kQ_1Q_2}{r^2}$ ✓

$F_1 = \frac{9 \times 10^9 \times 2,38 \times 10^{-6} \times 2,38 \times 10^{-6}}{0,1^2}$ ✓

F_1 = 5,10 N right

$F_2 = \frac{9 \times 10^9 \times 2,38 \times 10^{-6} \times 2,38 \times 10^{-6}}{0,05^2}$ ✓

F_2 = 42,84 N left / *links*

$F_{net} = F_1 + F_2$

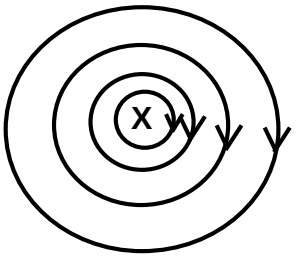
F_{net} = 42,84 – 5,10 ✓

F_{net} = 37,74 N left / *links* ✓ (5)

[17]

QUESTION 9/*VRAAG 9*

9.1



CRITERIA FOR MARKING/ *KRITERIA VIR NASIEN*	
Circular shape/ *Korrekte vorm*	✓
Field direction/ *Veldrigting*	✓

(2)

9.2 9.2.1 The magnitude of the induced emf across 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 geleier is direk eweredig aan die tempo van verandering in die magnetiese vloed met die geleier. (2)

9.2.2 $\Phi = B A \cos\theta$
$\Phi = B (\pi r^2) \cos\theta$ } Any one/*Enige een* ✓

$\Phi = 3,5 (\pi \times 0,05^2) \cos 0^o$ ✓

Φ = 0,03 Wb ✓ (0,027 Wb) (3)

9.2.3 $\varepsilon = \frac{-N\Delta\Phi}{\Delta t}$ ✓

$\varepsilon = \frac{-350(0 - 0,03)}{0,1}$ ✓

ε = 105 V ✓ (3)

[10]

QUESTION 10/*VRAAG 10*

10.1 10.1.1 The inverse of the resistance / *Die omgekeerde van die weerstand*

OR/ *OF* $\frac{1}{R}$ ✓ (1)

10.1.2

OPTION 1/ *OPSIE 1*	**OPTION 2/ *OPSIE 2***
Gradient/ *Gradiënt* = $\frac{\Delta I}{\Delta v}$ Gradient/ *Gradiënt* = $\frac{1,0-0,2}{3,0-0,6}$ ✓ Gradient/ *Gradiënt* = $\frac{1}{3}$ Gradient/ *Gradiënt* = $\frac{1}{R} = \frac{1}{3}$ ✓ R = 3 Ω ✓	R = $\frac{V}{I}$ ✓ R = $\frac{3.0}{1,0}$ ✓ R = 3 Ω ✓

(3)

10.2 10.2.1

OPTION 1/ *OPSIE 1*	**OPTION 2/ *OPSIE 2***
$R_1 = R_2$ $I_1 = I_2 = 1$ A ✓ $I = I_1 + I_2$ ✓ I = 1 + 1 = 2 A ✓	R = $\frac{V}{I}$ R = 6 + 6 = 12 Ω 12 = $\frac{V_p}{1}$ V_p = 12 V 12 = $\frac{12}{I}$ I = 1 A ✓ $I = I_1 + I_2$ ✓ I = 1 + 1 = 2 A ✓

(3)

10.2.2 R = $\frac{V}{I}$ ✓

12 = $\frac{V_p}{1}$ ✓

V_p = 12 V

$V = V_s + V_p$

15 = V_s + 12 ✓

V_s = 3 V

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

R = $\frac{3}{2}$ ✓

R = 1,5 Ω ✓ (5)

10.3 Increase, ✓ the total resistance decreases and the current increases. ✓
Verhoog, die totale weerstand verlaag en die stroom verhoog. (2)

10.4 $W = P\Delta t$ ✓
$W = 1,5 \times 3,5$ ✓
$W = 5,25$ kWh
Cost = 5,25 x 1,15
Cost = R6,04 ✓ (3)
[17]

TOTAL/*TOTAAL*: 150