



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE/
NASIONALE
SENIOR SERTIFIKAAT**

GRADE/GRAAD 11

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

EXEMPLAR/MODEL 2014

MEMORANDUM

MARKS/PUNTE: 150

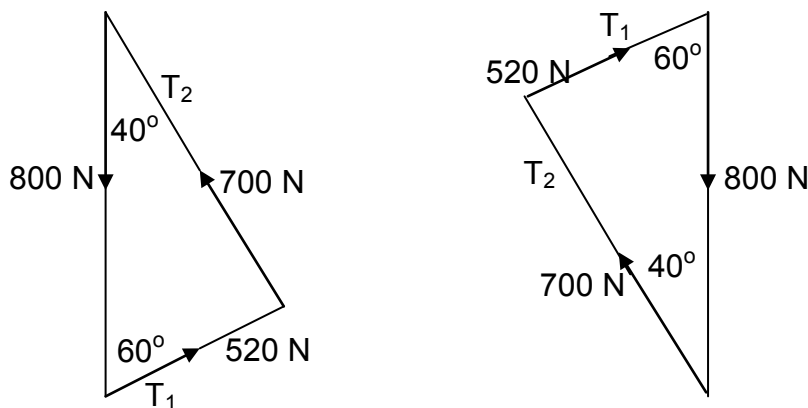
**This memorandum consists of 15 pages.
*Hierdie memorandum bestaan uit 15 bladsye.***

QUESTION 1/VRAAG 1

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

QUESTION 2/VRAAG 2

2.1 **CHECK ANSWER BY CONSTRUCTION AND MEASUREMENT
 VERGELYK ANTWOORD DEUR KONSTRUKSIE EN METING**



NOTES/AANTEKENINGE	
Weight (w) measured to accuracy of ± 5 N / <i>Gewig (w) gemeet tot akkuraatheid van ± 5 N</i> Anything beyond ± 10 N should attract 1 mark only <i>Enigiets bo ± 10 N kan slegs 1 punt kry</i>	✓
Tension force T_1 measured to accuracy of ± 10 N <i>Spanning T_1 korrek gemeet tot 'n akkuraatheid van ± 10 N</i>	✓✓
Tension force T_2 measured to accuracy of ± 10 N <i>Spanning T_2 korrek gemeet tot 'n akkuraatheid van ± 10 N</i>	✓✓
Angle of 60° and 40° accurately obtained (may not be indicated, but must be measured to ascertain). <i>Hoek van 60° en 40° akkuraat verkry (mag nie aangedui word nie, maar moet gemeet word om te bepaal).</i>	✓✓

Penalise 1 mark if distance (cm) instead of forces indicated on diagram (if final answer is correctly written). <i>Penaliseer 1 punt indien afstand (cm) in plaas van kragte op diagram aangedui word (indien finale antwoord korrek geskryf is).</i>	
Penalise 1 mark if no scale is indicated. <i>Penaliseer 1 punt indien geen skaal aangedui is nie</i>	
If no answer is given but sketch correctly shown in cm, award only 3 marks. <i>Indien geen antwoord gegee is nie, maar die skets is korrek in cm getoon, ken slegs 3 punte toe.</i>	

2.1 **BY CALCULATION / DEUR BEREKENING**

OPTION 1/OPSIE 1

$$T_1 \sin 30 + T_2 \sin 50 \checkmark = 800 \checkmark \dots\dots\dots(1)$$

$$T_1 \cos 30 = T_2 \cos 50 \checkmark \dots\dots\dots(2)$$

$$T_2 = \frac{T_1 \cos 30}{\cos 50}$$

$$\therefore \frac{(T_1 \cos 30)(\sin 50) \checkmark}{\cos 50} + T_1 \sin 30 = 800$$

$$1,532 T_1 = 800$$

$$T_1 = 522,19 \text{ N} \checkmark$$

$$T_2 = \frac{(522,19)(\cos 30) \checkmark}{\cos 50}$$

$$= 703,54 \text{ N} \checkmark$$

OPTION 2/OPSIE 2

$$\frac{T_2 \checkmark}{\sin 60} = \frac{800 \checkmark}{\sin 80}$$

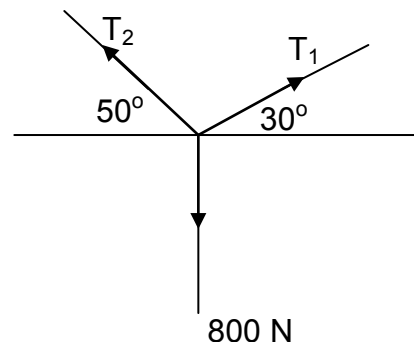
$$T_2 = \frac{(800)(\sin 60) \checkmark}{\sin 80}$$

$$T_2 = 703,51 \text{ N} \checkmark$$

$$\frac{T_1 \checkmark}{\sin 40} = \frac{800}{\sin 80}$$

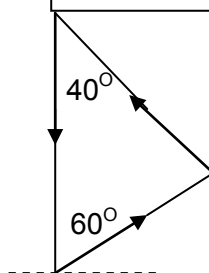
$$T_1 = \frac{(800)(\sin 40) \checkmark}{\sin 80}$$

$$= 522,16 \text{ N} \checkmark$$



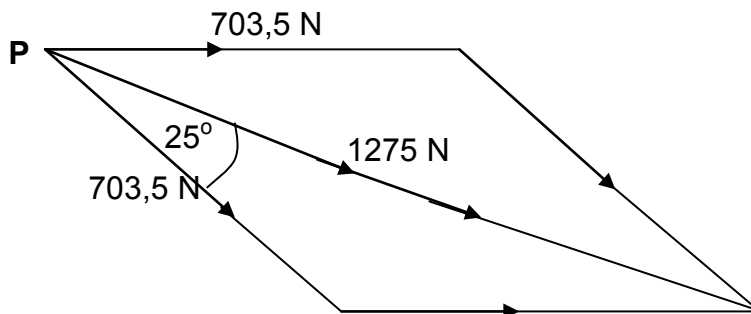
NOTE/LET WEL:
 Do not penalise if sketch is not shown.
Moenie penaliseer indien skets nie getoon is nie

NOTE/LET WEL:
 Do not penalise if sketch is not shown
Moenie penaliseer indien skets nie getoon is



(7)

2.2 BY CONSTRUCTION AND MEASUREMENT: DEUR KONSTRUKSIE EN METING
POSITIVE MARKING FROM QUESTION 2.1/ POSITIEWE NASIEN VANAF VRAAG 2.1

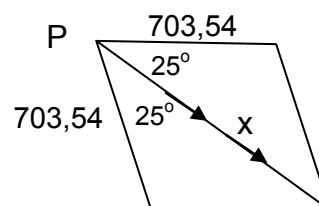


Parallelogram drawn with adjacent sides equal to T_2 <i>Parallelogram getrek met aangrensende kante gelyk aan T_2.</i>	✓✓
Angle of 50° or 25° accurately obtained May not be indicated, but must be measured to ascertain. <i>Hoek van 50° of 25° akkuraat verkry</i> <i>Mag nie aangedui word nie, maar moet gemeet word om te bepaal.</i>	✓
Reaction force recorded as $1\ 275\ N \pm 10\ N$ <i>Reaksiekrag aangeteken as $1\ 275\ N \pm 10\ N$</i>	✓
Penalise 1 mark if distance (cm) instead of forces indicated on diagram (if final answer is correct). <i>Penaliseer 1 punt indien afstand (cm) in plaas van kragte aangedui word op diagram (indien finale antwoord korrek is).</i>	
If no answer is given but sketch shown in cm, award only 1 mark. <i>Indien geen antwoord gegee word nie, maar skets getoon in cm, ken slegs 1 punt toe.</i>	

2.2 BY CALCULATION: (POSITIVE MARKING FROM QUESTION 2.1)
DEUR BEREKENING (POSITIEWE NASIEN VANAF VRAAG 2.1)
OPTION 1/OPSIE 1

$$\frac{703,54}{\sin 25} = \frac{x}{\sin 130}$$

$$x = \frac{(703,54)(\sin 130)}{\sin 25}$$

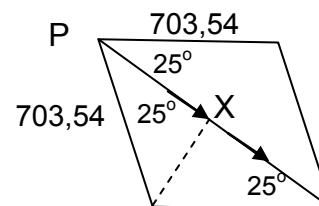


reaction force / *reaksiekrag* = $1275,25\ N$ ✓ at 25° below the horizontal/ *onder die horisontaal* ✓ (or/of 335°)

OPTION 2/OPSIE 2

$$\sin 65 = \frac{PX}{703,54}$$

$$PX = 637,62$$

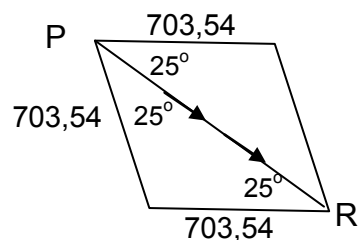


Reaction force/*Reaksiekrag* = $2PX$ ✓ = $1275,25\ N$ ✓ at 25° below the horizontal/*onder die horisontaal* ✓ (or/of 335°)

OPTION 3/OPSIE 3

$$c^2 = a^2 + b^2 - 2ab \cos C$$

$\therefore PR^2 = 703,54^2 + 703,54^2 - 2(703,54)(703,54) \cos 130^\circ$
 $PR = 1275,25 \text{ N}$ at 25° below the horizontal /onder die horisontaal (or/of 335°)



(4)
 [11]

QUESTION 3/VRAAG 3

3.1 The force that opposes the tendency of motion of a stationary object relative to a surface. ✓✓ / Die krag wat die neiging tot beweging van 'n stilstaande liggaam relatief tot 'n oppervlak teenwerk.

OR/OF

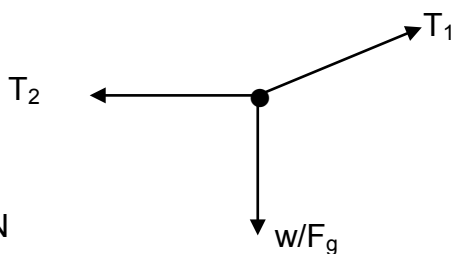
The force of friction developed between two surfaces that are at rest. / Die krag of wrywing wat ontwikkel word tussen twee oppervlakke wat in rus is. (2)

3.2 The resultant of all forces ✓ acting at point S is zero ✓ / Die resultaat van al die kragte wat op punt S inwerk, is nul.

Net force ✓ at S equals zero ✓ / Netto krag by S is gelyk aan nul.

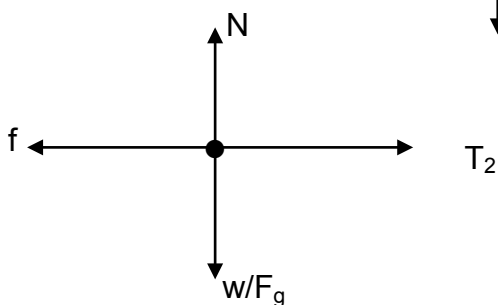
There is no acceleration ✓✓ / Daar is geen versnelling nie (2)

3.3.1 (3)



Do not penalise if angle is not shown. / Moenie penaliseer indien die hoek nie aangedui is nie. Deduct maximum 1 mark if arrows do not touch the dot. Trek 'n maksimum van 1 punt af as pyltjies nie die kolletjie raak nie

3.3.2 (4)



Deduct maximum 1 mark if arrows do not touch the dot. Trek 'n maksimum van 1 punt af as pyltjie nie die kolletjie raak nie.

3.4 For the string/ *Vir die toutjie*
 $-T_2 + T_1 \cos 35^\circ = 0$
 $\therefore T_1 \cos 35^\circ = T_2 \dots\dots\dots(1) \checkmark$
 $T_1 \sin 35^\circ = w_P \dots\dots\dots(2) \checkmark$

For the block/ *Vir die blok*
 $T_2 - f_s = 0$
 $T_2 = f_s = \mu_s N \checkmark$
 $T_2 = 0,25 (70)(9,8) \dots\dots\dots(3) \checkmark$

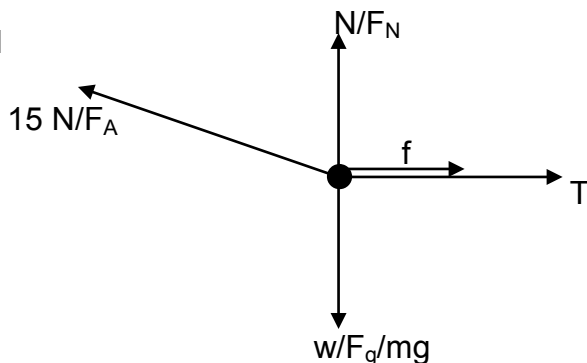
$T_1 = \frac{(0,25)(70)(9,8)}{\cos 35^\circ}$ from (1)/ *vanaf (1)*

From (2) and (3)/ *Vanaf (2) en (3)*
 $0,25(70)(9,8) \sin 35^\circ \checkmark = w_P$
 $120,09 \text{ N} \checkmark$

(7)
[18]

QUESTION 4/VRAAG 4

4.1



(5)

NOTE/LET WEL:
 1 mark for each force correctly shown emanating from the dot.
 1 punt vir elke krag korrek aangetoon wat uit die kolletjie voortspruit.

4.2 When a net force is applied to an object of mass m , it accelerates in the direction of the force at an acceleration directly proportional to the force and inversely proportional to the mass of the object. $\checkmark \checkmark$
Wanneer 'n netto krag op 'n liggaam met massa m toegepas word, versnel dit in die rigting van die krag teen 'n versnelling wat direk eweredig is aan die krag en omgekeerd eweredig is aan die massa van die liggaam.

OR/OF

When a net force acts on an object of mass m , the acceleration that results is directly proportional to the net force, has a magnitude that is inversely proportional to the mass and a direction that is the same as that of the net force. $\checkmark \checkmark$

Wanneer 'n netto krag op 'n liggaam met massa m inwerk, is die gevolglike versnelling direk eweredig aan die netto krag, het 'n grootte wat omgekeerd eweredig is aan die massa en 'n rigting wat diedelfde is as dié van die netto krag.

(2)

4.3 $N = w - F_A \sin \theta \checkmark$
 $= 8(9,8) - 15 \sin 30 \checkmark$
 $= 70,9 \text{ N} \checkmark$

(3)

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

For the 8 kg block/Vir die 8 kg-blok

$$15 \cos 30^\circ - T - f_k = ma \checkmark$$

$$15 \cos 30^\circ - T - \mu_k N = 8a$$

$$\underline{15(0,866) - T - (0,25)(70,9) = 8a \checkmark}$$

$$-4,735 - T = 8a \dots\dots\dots(1)$$

For the 5 kg block/Vir die 5 kg-blok

$$T - w = ma \checkmark$$

$$T - 5(9,8) = 5a \checkmark \dots\dots\dots(2)$$

From (1) and (2)/ Vanaf (1) en (2)

$$-53,735 = 13a$$

$$a = -4,133 \text{ m}\cdot\text{s}^{-2}$$

from/vanaf (1)

$$-4,735 - T = \underline{8(-4,133)} \checkmark$$

$$T = 28,32(9) \text{ N} \checkmark$$

OR/OF

From /vanaf (2)

$$T - 5(9,8) = 5(-4,133) \checkmark$$

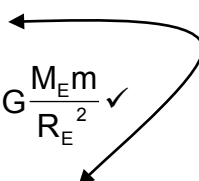
$$T = 28,33(5) \text{ N} \checkmark$$

(6)
[16]

QUESTION 5/VRAAG 5

- 5.1 Every body in the universe attracts every other body 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 liggaam in die heelal trek 'n elke ander liggaam aan met 'n krag 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 $w = mg \checkmark$
 $m = 14,29 \text{ (14,286 kg)} \checkmark$



$$F = G \frac{m_1 m_2}{r^2} \text{ OR/OF } F = G \frac{M_E m}{R_E^2} \checkmark$$

$$= 6,67 \cdot 10^{-11} \times \frac{(5,98 \times 10^{24})(14,286)}{[(6,38 \pm 6,7) \times 10^6]^2} \checkmark$$

$$= 33,31 \text{ N}$$

Change /Verandering = $(140 \checkmark - 33,31) = 106,69 \text{ N}$

$$\% \text{ change/verandering} = \frac{106,699}{140} \times 100$$

$$= 76,21 \% \checkmark$$

OPTION B/OPSIE B

$w = mg$ ✓

$m = 14,29$ (14,286 kg) ✓

$w = mg = G \frac{M_E m}{R_E^2}$

$g' = G \frac{M_E}{R_E^2}$ ✓

$= 6,67 \times 10^{-11} \frac{(5,98 \times 10^{24})}{[(6,38 + 6,7) \times 10^6]^2}$ ✓

$g' = 2,331 \text{ m} \cdot \text{s}^{-2}$

(New weight / Nuwe gewig) $w' = mg' = 14,286 \times 2,331$
 $= 33,301 \text{ N}$

Change/Verandering = $(140 - 33,30) = 106,699 \text{ N}$

% change/verandering = $\frac{106,699}{140} \times 100$
 $= 76,21 \%$ ✓

(8)
[10]

QUESTION 6/VRAAG 6

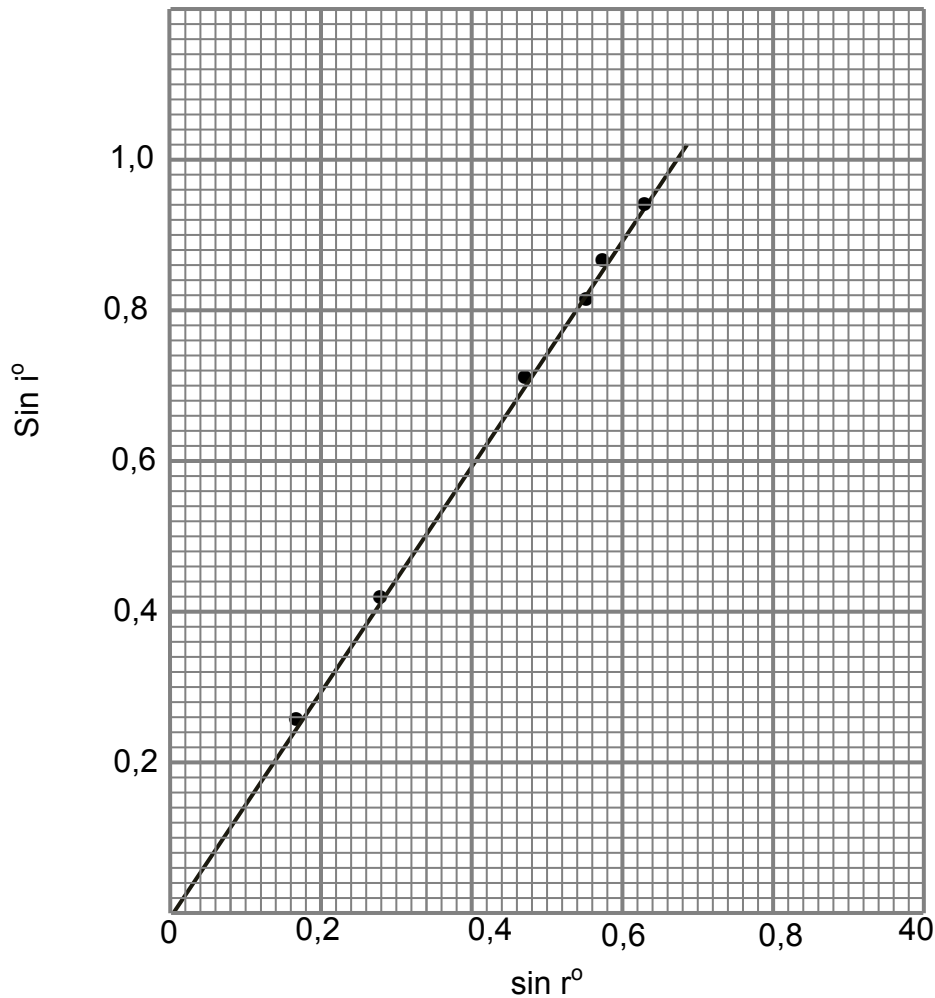
6.1.1 $r / \sin r$ ✓ (1)

6.1.2 $i / \sin i$ (1)

6.1.3 The type of block used/temperature of the surroundings/source of light/surface on which block is placed
Die tipe blok gebruik/temperatuur van die omgewing/bron van die lig/oppervlak waarop blok geplaas word. (1)

6.2

Graph of sin i versus sin r / Grafiek van sin i teenoor sin r



$$\begin{aligned} \text{Slope of graph / Helling van grafiek} = n &= \frac{\Delta \sin i}{\Delta \sin r} \checkmark \\ &= \frac{(0,9 - 0)}{(0,6 - 0)} \checkmark \\ &= 1,5 \checkmark \end{aligned}$$

RUBRIC FOR MARKING GRAPH / RUBRIEK VIR NASIEN VAN GRAFIEK

Axes correctly chosen and labelled / Asse korrek gekies en benoem	✓
Graph has a descriptive title / Grafiek het 'n beskrywende titel	✓
Correctly plotted points (minimum of 4 points) / Punte korrek geteken (minimum van 4 punte)	✓✓
Best line of fit / Beste lyn van passing	✓
Deduct a maximum of 1 mark if more than 3 points are incorrectly plotted Trek 'n maksimum van 1 punt af indien meer as 3 punte verkeerd getrek is	

(8)

6.3

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

$$v = \frac{3 \times 10^8}{1,5} \checkmark$$

$$= 2 \times 10^8 \text{ m}\cdot\text{s}^{-1} \checkmark$$

(3)
 [14]

QUESTION 7/VRAAG 7

7.1 The index of refraction of the incident medium multiplied by the sine of the incident angle is equal to the index of refraction of the refracting medium multiplied by the sine of the refracted angle. ✓✓
Die brekingsindeks van die invallende medium vermenigvuldig met die sinus van die invalshoek is gelyk aan die brekingsindeks van die refraktiewe medium vermenigvuldig met die sinus van die gebreekte hoek.

NOTE/LET WEL:
 Only 1 mark for
Slegs 1 punt vir
 $\frac{\sin i}{\sin r} = \text{a constant.}$
 = 'n konstante

OR/OF

When light passes from one medium into another, the ratio of the sine of the angle of incidence to the sine of the angle of refraction is a constant.

As lig van een medium na 'n ander beweeg, is die verhouding van die sinus van die invalshoek tot die sinus van die brekingshoek 'n konstante.

(2)

7.2

$$\sin c = \frac{1}{n} \checkmark$$

$$= \frac{1}{1,66} \checkmark$$

$$c = 37,04^\circ \checkmark$$

(3)

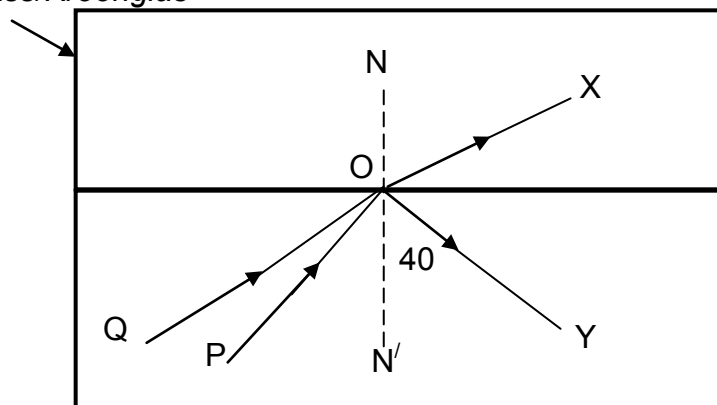
7.3

&7.4

(1)

(2)

Crown glass/Kroonglas



Flint glass/Flintglas

7.5 Greater than/*Groter as* ✓ (1)
[9]

QUESTION 8/VRAAG 8

- 8.1 The bending of a wave as it passes around the edges of an object.
Die buiging van 'n golf soos dit om die kante van 'n voorwerp beweeg.
OR/OF
The bending of a wave around an obstacle or the corners of a narrow opening.
Die buiging van 'n golf om 'n versperring of deur die hoeke van 'n nou spleet/opening.
OR/OF
The ability of a wave to spread out in wave fronts as they pass through a small aperture or around a sharp edge.
Die vermoë van 'n golf om in golf fronte uit te spreid soos hulle deur 'n klein opening of om 'n skerp kant beweeg. (2)
- 8.2 A broad central bright band ✓ with alternating bright and dark band (of decreasing intensity) on either side of it. ✓ / 'n Breë, sentrale helder band met afwisselende helder en donker bande (van afnemende intensiteit) aan weerskante. (2)
- 8.3 Huygen's principle/ *Huygen se beginsel* ✓
Principle of superposition / *Beginsel van superposisie* ✓ (2)
- 8.4.1 Patterns become narrower / *Patrone word nouer.* ✓ (1)
- 8.4.2 Brightness is unchanged/remains the same./ *Helderheid is onveranderderd / bly dieselfde* ✓ (1)
- 8.5 The patterns become narrower / *Patrone word nouer.* ✓ (1)
[9]

QUESTION 9/VRAAG 9

- 9.1 Electric field at a point is defined as the force acting per unit charge. ✓✓
Elektriese veld by 'n punt word gedefinieer as die krag wat inwerk per eenheidslading.
OR/OF
It is the force experienced by a unit positive charge placed at that point.
Dit is die krag wat deur 'n eenheid positiewe lading geplaas by daardie punt ondervind word. (2)

9.2 $E_{\text{net}} = 0$
OR/OF
 $E_1 + E_2 = 0$

$$\frac{kQ_1}{r_1^2} + \frac{kQ_2}{r_2^2} = 0 \checkmark$$

$$\frac{(9 \times 10^9)(2 \times 10^{-6})}{(0,2 - x)^2} - \frac{(9 \times 10^9)(3 \times 10^{-6})}{x^2} = 0$$

$$\frac{2}{(0,2 - x)^2} = \frac{3}{x^2}$$

Taking square root/Neem vierkantswortel

$$\frac{1,414}{(0,2 - x)^2} = \frac{1,732}{x^2}$$

$x = 0,11 \text{ m} \checkmark$

(7)

9.3 $F = \frac{kQ_1Q_2}{r^2} \checkmark$

Force experienced by the +3 μC charge due to the + 2 μC charge = $F_{3,2}$
Krag ondervind deur die +3 μC -ading as gevolg van die + 2 μC -lading = $F_{3,2}$

$$F_{3,2} = 9 \times 10^9 \frac{(2 \times 10^{-6})(3 \times 10^{-6})}{(0,2)^2} \checkmark$$

= 1,35 N to the right (east) / *na regs (oos)*

Force experienced by the +3 μC charge due to the presence of the - 4 μC charge = $F_{3,4}$

Krag ondervind deur die +3 μC -lading as gevolg van die - 4 μC -lading = $F_{3,4}$

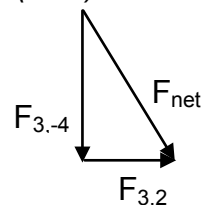
$$F_{3,4} = 9 \times 10^9 \frac{(4 \times 10^{-6})(3 \times 10^{-6})}{(0,1)^2}$$

= 10,8 N downwards (southwards)/*afwaarts (suid)*

$$F_{\text{net}} = \sqrt{F_1^2 + F_2^2}$$

$$= \sqrt{(10,8)^2 + (1,35)^2} \checkmark$$

= 10,88 N \checkmark



(5)
[14]

QUESTION 10/VRAAG109

10.1 North Pole/Noordpool ✓✓ (2)

10.2 North Pole/Noordpool ✓ (1)

10.3 There will be no reading (deflection) ✓
Daar sal geen lesing (afwyking) waargeneem word nie
 An emf is induced only when the magnetic (flux) links with the coil. This is achieved when either the magnet (producing the field) or coil is moving. ✓
'n Emk word slegs geïnduseer as die magnetiese vloedlyne met die spoel koppel. Dit word bereik wanneer óf die magneet (wat die veld verskaf) óf die spoel beweeg.

ACCEPT/AANVAAR

Either the coil or magnet must be moving to induce an emf.
Óf die spoel óf die magneet moet beweeg om 'n emk te induseer. (2)

10.4 The magnitude of the induced emf (in a conductor) is equal to the rate of change of magnetic flux linkage. ✓✓
Die grootte van die geïnduseerde emk (in 'n geleier) is gelyk aan die tempo van verandering van magnetiese vloedkoppeling.

OR/OF

The emf induced in a conducting loop is equal to the negative of the rate at which the magnetic flux through the loop is changing with time ✓✓
Die geïnduseerde emk in 'n geleidende lus is gelyk aan die negatiewe van die tempo waarteen die magnetiese vloedlyne deur die lus verander oor tyd.

ACCEPT/AANVAAR:

The emf induced in a conductor is proportional to the rate at which magnetic field lines are cut by a conductor. ✓✓
Die geïnduseerde emk in 'n geleier is eweredig aan die tempo waarteen die magneetveldlyne deur 'n geleier gesny word. (2)

10.5 $\epsilon = -N \frac{\Delta\Phi}{\Delta t}$ ✓

OR

$$\epsilon = -N \frac{(\Phi_{70} - \Phi_{30})}{\Delta t} = -N \frac{(BA \cos 70^\circ - BA \cos 30^\circ)}{\Delta t}$$

$$= -100 \frac{[(4 \times 10^{-4})(4,8 \times 10^{-4}) \cos 70^\circ - (4 \times 10^{-4})(4,8 \times 10^{-4}) \cos 30^\circ]}{0,2}$$

OR/OF

$$-100 \frac{[(4 \times 10^{-4})(4,8 \times 10^{-4})](\cos 70^\circ - \cos 30^\circ)}{0,2}$$

$$\epsilon = 5,03 \times 10^{-5} \text{ V} \quad (5)$$

10.6 $\epsilon = IR$ ✓
 $I = \frac{5,03 \times 10^{-5}}{2}$ ✓
 $= 2,52 \times 10^{-5} \text{ A}$ ✓ (3)

[15]

QUESTION 11/VRAAG 11

- 11.1 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.

OR/OF

Provided temperature and other physical conditions are constant ✓, the potential difference across a conductor is directly proportional to the current ✓.
Mits die temperatuur en ander fisiese toestande konstant is, is die potensiaalverskil oor 'n geleier direk eweredig aan die stroom. (2)

- 11.2 **OPTION 1/OPSIE 1**

$$\begin{aligned} V_1 &= IR_{6\Omega} \checkmark \\ &= 0,6 (6) \checkmark \\ &= 3,6 \text{ V} \end{aligned}$$

$$I_{4\Omega} = \frac{3,6}{4} \checkmark$$

$$\therefore I_{4\Omega} = 0,9 \text{ A} \checkmark$$

OPTION 2/OPSIE 2

$$V = IR \checkmark$$

$$(0,6)(6) = I_{4\Omega}(4) \checkmark$$

$$I_{4\Omega} = \frac{(0,6)(6)}{4} \checkmark$$

$$= 0,9 \text{ A} \checkmark$$
 (4)

- 11.3 **POSITIVE MARKING FROM QUESTION 11.2.1**
POSITIEWE NASIEN VANAF VRAAG 11.2.1

$$\begin{aligned} I_{\text{tot}} &= I_{6\Omega} + I_{4\Omega} \\ &= (0,6 + 0,9) \checkmark \end{aligned}$$

$$I_{\text{tot}} = 1,5 \text{ A} \checkmark$$
 (2)

- 11.4 **POSITIVE MARKING FROM QUESTION 11.2.1 AND QUESTION 11.2.2**
POSITIEWE NASIEN VANAF VRAAG 11.2.1 EN VRAAG 11.2.2

$$\begin{aligned} V_X &= V_{\text{tot}} - V_1 \\ &= (6 - 3,6) \checkmark \\ &= 2,4 \text{ V} \end{aligned}$$

$$V = IR \checkmark$$

$$X = \frac{2,4}{1,5}$$

$$= 1,6 \Omega \checkmark$$
 (3)

11.5 Energy/Energie $W = I^2 R \Delta t$ ✓
For the same time interval $I^2 R \Delta t$ will be greater for the 4Ω resistor than for the 6Ω resistor. ✓
Vir dieselfde tydinterval sal $I^2 R \Delta t$ groter wees vir die 4Ω -resistor as vir die 6Ω -resistor.

OR/OF

$$\text{Energy/Energie } W = \frac{V^2}{R} \Delta t \checkmark$$

For the same potential difference and time $\frac{V^2}{R} \Delta t$ is greater for the smaller resistance than for the larger resistance. ✓

Vir dieselfde potensiaalverskil en tyd is $\frac{V^2}{R} \Delta t$ groter vir die kleiner weerstand as vir die groter weerstand.

(3)
[14]

TOTAL/TOTAAL: 150