



Province of the
EASTERN CAPE
EDUCATION

**NATIONAL SENIOR CERTIFICATE
NASIONALE SENIOR SERTIFIKAAT**

GRADE/GRAAD 11

NOVEMBER 2013

**PHYSICAL SCIENCES P1/
FISIESE WETENSKAPPE V1
MEMORANDUM**

MARKS/PUNTE: 150

This memorandum consists of 8 pages./
Hierdie memorandum bestaan uit 8 bladsye.

QUESTION/VRAAG 1

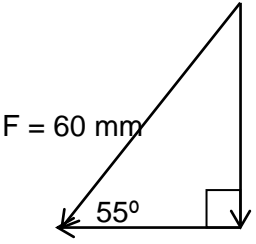
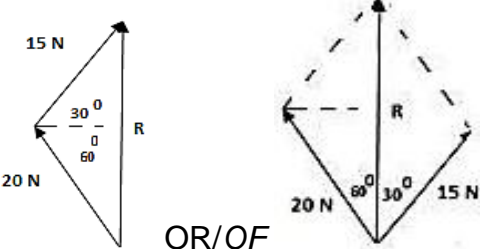
- | | | |
|-----|---|------------|
| 1.1 | Normal force/ <i>Normaalkrag</i> | (1) |
| 1.2 | Refractive index/ <i>Brekingsindeks</i> | (1) |
| 1.3 | Critical angle/ <i>Kritiesehoek (grenshoek)</i> | (1) |
| 1.4 | Electric field (strength)/ <i>Elektriese veld (sterkte)</i> | (1) |
| 1.5 | Energy (Work) done/ <i>Energie (Arbeid) verrig</i> | (1) |
| | | [5] |

QUESTION/VRAAG 2:

- | | | |
|------|---|-------------|
| 2.1 | C | (2) |
| 2.2 | D | (2) |
| 2.3 | C | (2) |
| 2.4 | C | (2) |
| 2.5 | B | (2) |
| 2.6 | A | (2) |
| 2.7 | C | (2) |
| 2.8 | C | (2) |
| 2.9 | A | (2) |
| 2.10 | B | (2) |
| | | [20] |

TOTAL SECTION/TOTAAL AFDELING A: 25

QUESTION/VRAAG 3

3.1	3.1.1		<p> $F = 60 \text{ mm} \checkmark$ $= 55^\circ \checkmark$ $X = 34 \text{ mm} \checkmark$ (accept/aanvaar 33 – 35) $102 \text{ N} \checkmark$ (accept/aanvaar 99 N – 105 N) left/links $Y = 49 \text{ mm}$ (accept/aanvaar 48 – 50) \checkmark $147 \text{ N} \checkmark$ (accept/aanvaar 144 N – 150 N) down/af \checkmark All 3 arrows correct/AI 3 pyle korrek \checkmark </p> <p>If a calculation was done instead of a construction – max 4 out of 7 <i>Indien 'n berekening gedoen is i.p.v. 'n konstruksie – maks. 4 uit 7</i> Right angled triangle with information shown/Reghoekige driehoek met inligting getoon \checkmark All 3 arrows correct/AI 3 pyle korrek \checkmark $X = 60 \cos 55^\circ = 33,97 \text{ mm} \checkmark$ $102 \text{ N} \checkmark$ $Y = 60 \sin 55^\circ = 49,15 \text{ mm} \checkmark$ $147 \text{ N} \checkmark$ </p>	(7)
	3.1.2	Positive marking from Q3.1.1/Positiewe nasien vanaf Vr3.1.1 $w = mg = 30(9,8) \checkmark = 294 \text{ N} \checkmark$ normal force/normaalkrag = $294 + 147 = 441 \text{ N} \checkmark$		(3)
3.2	A single vector \checkmark with the same effect as a number of vectors acting on an object. \checkmark <i>'n Enkel vektor \checkmark wat dieselfde effek het as 'n aantal vektore wat saam op 'n voorwerp inwerk. \checkmark</i>			(2)
3.3	3.3.1	one mark for correct vector diagram/een punt vir korrekte vektordiagram $R = \sqrt{20^2 + 15^2} = 25 \text{ N} \checkmark \checkmark$		(3)
	3.3.2	$\tan \theta = \frac{15}{20}$ $\theta = 36,87^\circ \checkmark$ thus/dus $6,87^\circ \checkmark$ (clockwise from the positive y-axis/ kloksgewys vanaf die y-as)	 <p style="text-align: center;">OR/OF</p>	(2)
3.4	When three or more vectors drawn <u>head to tail</u> form a closed figure, \checkmark their resultant is zero or they are in equilibrium/balanced. \checkmark <i>Wanneer drie of meer vektore <u>kop-stert geteken</u> word en 'n geslote figuur vorm, \checkmark is hul resultant nul of is hulle in ewewig/gebalanseerd \checkmark</i>			(2)

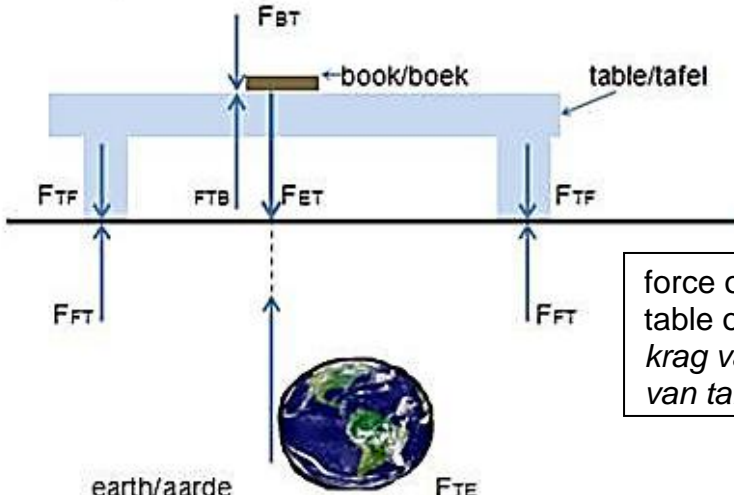
QUESTION/VRAAG 4

4.1		(3)	
4.2	4.2.1	<p>The kinetic frictional force is the only force acting on the sled in x direction and opposes the motion of the sled so the net force is given by/<i>Die kinetiese wrywingskrag is die enigste krag op die skild in x-rioting en staan die beweging van die slee teen sodat die krag gegee word deur.</i></p> <p> $F_{\text{net}} = ma \checkmark$ OR/OF $f_k = \mu_k N \checkmark = 0,06 \text{ m} (9,8) \checkmark = 0,588 \text{ m N}$ $\mu_k mg \checkmark = ma$ $F_{\text{net}} = ma \checkmark 0,588 \text{ m} = m a$ $\mu_k g = a$ $a = 0,588 \text{ m.s}^{-2} \checkmark$ or/of $0,59 \text{ m.s}^{-2}$ $6 \times 10^{-2} \times 9,8 = a \checkmark$ $a = 0,588 \text{ m.s}^{-2} \checkmark$ or/of $0,59 \text{ m.s}^{-2}$ </p>	(4)
	4.2.2	<p>POSITIVE MARKING FROM QUESTION 4.2.1 <i>POSITIEWE NASIEN VAN VRAAG 4.2.1</i></p> <p> $v_f^2 = v_i^2 + 2a\Delta x \checkmark$ $0^2 = 6^2 + 2(-0,588) \Delta x \checkmark$ (the sled decelerates/<i>die slee vertraag</i>) $\Delta x = 30,61 \text{ m} \checkmark$ (if/as $a = 0,59 \text{ m.s}^{-2}$ then/<i>dan</i> $\Delta x = 30,51 \text{ m}$) </p>	(3)

[10]

QUESTION/VRAAG 5

5.1		(3)
5.2	<p> $F_{\text{net}} = ma = 400 + 250 + (-500) \checkmark = 2000 a \checkmark$ $150 = 2000 \times a$ $a = 0,075 \text{ m.s}^{-2} \checkmark$ to the right/<i>na regs</i> </p>	(4)
5.3	<p> $F_{g//} = F_g \sin \theta = mg \sin \theta \checkmark$ $= 2000 (9,8) \sin 5^\circ$ $= 1\ 708,25 \text{ N} \checkmark$ </p>	(2)
5.4	accelerate down the incline/ <i>versnel teen die steilte af</i>	(1)
5.5	<p>Inertia is the tendency of an object to resist change \checkmark <i>Traagheid is 'n voorwerp se vermoë om verandering teen te staan</i> \checkmark</p>	(1)

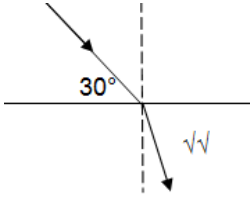
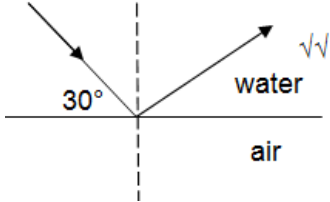
<p>5.6</p>	<p>A person will keep on moving forward in a straight line at constant velocity unless acted on by a resultant force ✓ The seatbelt acts as a net force ✓ which hold you safely in the seat. <i>’n Liggaam sal aanhou beweeg in ’n reguit lyn teen ’n konstante snelheid tensy ’n resultante krag daarop inwerk. ✓ Die veiligheidsgordel is die net krag ✓ wat jou veilig in die sitplek hou.</i> OR/OF In an accident seatbelts hold you safely in place because of Newton’s First law of motion and inertia. ✓ When a car suddenly slows down the seatbelt acts as net force ✓ which helps the passengers from being hurt. <i>In ’n ongeluk hou die veiligheidsgordel jou veilig in plek a.g.v. Newton se eerste wet/traagheid. ✓ Wanneer ’n motor skielik stadiger ry, tree die veiligheidsgordel as die netto krag op ✓ wat help dat die passasier nie seerkry nie.</i></p>	<p>(2)</p>
<p>5.7</p>	<p>Newton’s third law of motion states that when object A exerts a force on object B, object B simultaneously exerts an oppositely directed force of equal magnitude on object B. ✓✓ <i>Volgens Newton se derde bewegingswet: as voorwerp A ’n krag op voorwerp B uitoefen, oefen voorwerp B terselfde tyd ’n teenoorgestelde krag van dieselfde grootte op A uit. ✓✓</i></p>	<p>(2)</p>
<p>5.8</p>	 <p>force of book on table – force of table on book ✓ <i>krag van boek op tafel – krag van tafel op boek</i></p> <p>force of floor on table - force of table on floor ✓ <i>krag van vloer op tafel – krag van tafel op vloer</i></p> <p>force of earth on table - force of table on earth ✓ <i>krag van aarde op tafel – krag van tafel op aarde</i></p>	<p>(3)</p>

QUESTION/VRAAG 6

6.1	$F_{\text{sun earth}} = G \frac{M_{\text{sun}} M_{\text{earth}}}{d^2} \checkmark$ $= \frac{6,67 \times 10^{-11} \checkmark (1,99 \times 10^{30})(5,98 \times 10^{24}) \checkmark}{(2 \times 10^{11})^2 + (4 \times 10^8)^2 \checkmark}$ $= 1,98 \times 10^{22} \text{ N} \checkmark$	(5)
6.2	$g_{\text{moon}} = \frac{GM_{\text{moon}}}{d^2} \checkmark \quad \text{OR/OF} \quad F = m g = \frac{G m M}{d^2}$ $= \frac{6,67 \times 10^{-11} (7,35 \times 10^{22}) \checkmark}{(1,6 \times 10^6)^2 \checkmark}$ $= 1,92 \text{ m.s}^{-2} \checkmark$	(4)
6.3	$W = mg \checkmark = 50 \times 10^{-3} \times 9,8 \checkmark = 0,49 \text{ N} \checkmark$	(3)

[12]

QUESTION/VRAAG 7

7.1	7.1.1	$n_1 \sin \theta_1 = n_2 \sin \theta_2 \checkmark$ $1,00 \times \sin 47^\circ \checkmark = 1,33 \sin \theta_2 \checkmark$ $\sin \theta_2 = 0,55 \theta_2$ $= 33,36^\circ \checkmark$	(4)
	7.1.2	$n_1 \sin \theta_1 = n_2 \sin \theta_2$ $1,33 \sin 47^\circ \checkmark = 1,00 \sin \theta_2 \checkmark$ $\theta_2 = 76,58^\circ \checkmark$	(3)
7.2	$n = \frac{c}{v} \checkmark$ $1,33 = \frac{3 \times 10^8 \checkmark}{v}$ $v = 2,26 \times 10^8 \text{ m.s}^{-1} \checkmark$	(3)	
7.3	$n_1 \sin \theta_1 = n_2 \sin \theta_2$ $1,33 \sin \theta_1 \checkmark = 1,00 \sin 90^\circ \checkmark \theta_1 = 48,75^\circ$	(2)	
7.4	7.4.1		(2)
	7.4.2		(2)
7.5	(any of the following/enige van die volgende) -telecommunications/telekommunikasie \checkmark -video communications/videokommunikasie -computer-data communications/rekenaardatakommunikasie -medicine - endoscope)/medisyne - endoskoop	(1)	

[17]

QUESTION/VRAAG 8

8.1	Every point in a wave front acts as the source of secondary wavelets \checkmark that spread out in all directions with the same speed as a wave. \checkmark <i>Elke punt op die golffront dien as 'n bron van sekondêre golwe \checkmark wat uitsprei in alle rigtings met dieselfde spoed as die golf. \checkmark</i>	(2)
8.2	A – Central bright broad band/ <i>breë sentrale ligte band</i> \checkmark B – dark band/ <i>donker bande</i> \checkmark	(2)
8.3	A \checkmark	(1)
8.4	8.4.1 broader/ <i>breër</i> \checkmark	(1)
	8.4.2 broader/ <i>breër</i> \checkmark	(1)
8.5	diff α wavelength/ <i>diff α golflengte</i> $\checkmark\checkmark$	(2)

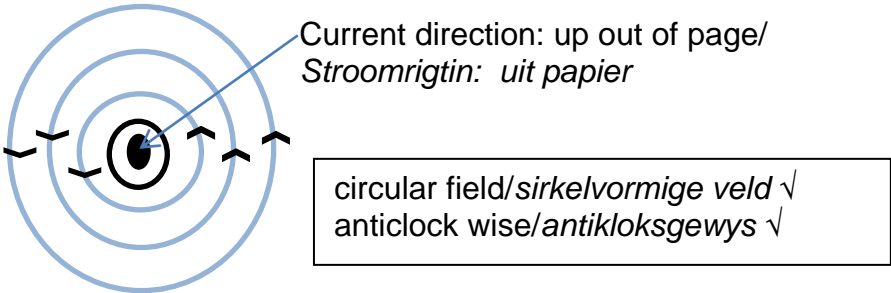
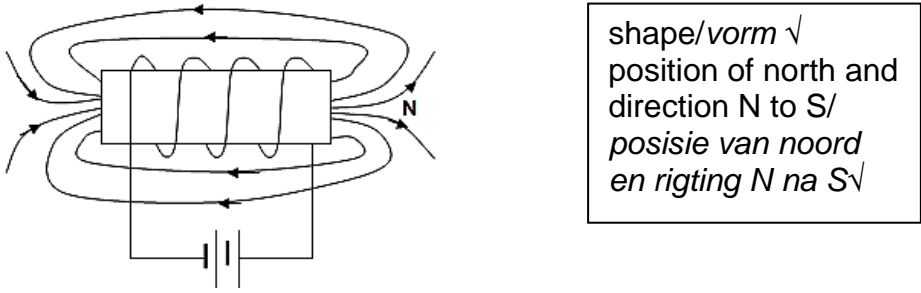
[9]

QUESTION/VRAAG 9

9.1	<p style="text-align: center;">q_1 \checkmark F_{12} F_{net} F_{13} \checkmark</p> <p style="text-align: center;">θ</p> <p style="text-align: right;">(3)</p>	9.2	$F_{12} = \frac{k q_1 q_2}{r^2} \checkmark$ $= \frac{9 \times 10^9 (4 \times 10^{-6})(6 \times 10^{-6})}{(0,15)^2} \checkmark$ $= 9,6 \text{ N } \checkmark$	(4)
9.3	$F_{13} = \frac{9 \times 10^9 (4 \times 10^{-6})(5 \times 10^{-6})}{(0,1)^2} \checkmark$ $= 18 \text{ N } \checkmark$ $F_{net} = \sqrt{9,6^2 + 18^2} \checkmark$ $= 20,4 \text{ N } \checkmark$ $\tan \theta = \frac{9,6}{18} \checkmark$ $\theta = 28,07^\circ \checkmark$ <p>(anticlockwise from positive x-axis) (<i>antikloksgewys vanaf die positiewe x-as</i>) (clockwise from the positive y-axis) (<i>kloksgewys vanaf die positiewe y-as</i>)</p> <p>OR/OF = $61,93^\circ$</p>	(7)		

[14]

QUESTION/VRAAG 10

10.1	10.1.1		(2)
	10.1.2		(2)
10.2	10.2.1	$\Phi = BA \cos \theta \checkmark = 0,72 (0,0176) \cos 0^\circ \checkmark = 0,013 \text{ Wb} \checkmark (0,012672 \text{ Wb})$ POSITIVE MARKING FROM Q10.2.1/POSITIEWE NASIEN VANAF VR10.2.1	(3)
	10.2.2	$\epsilon = -N \frac{\Delta \Phi}{\Delta t} \checkmark = \frac{-450 (0 - 0,013)}{0,22} \checkmark = 26,59 \text{ V} \checkmark$	(3)

[10]

QUESTION/VRAAG 11

11.1	11.1.1	$3\text{V} \checkmark$	(1)
	11.1.2	$I = V/R \checkmark = 3/5 \checkmark = 0,6 \text{ A} \checkmark$	(3)
	11.1.3	$I = V/R = 3 \checkmark / 7 \checkmark = 0,43 \text{ A}$ $V_2 = IR \checkmark = 0,43 \times 4 \checkmark = 1,72 \text{ V} \checkmark$ (accept/aanvaar 1,71 V)	(5)
11.2	11.2.1	$P = \frac{V^2}{R} \checkmark$ OR/OF $P = VI$ $2600 \checkmark = \frac{220^2}{R} \checkmark$ $2600 = 220 I \checkmark$ $R = 18,62 \Omega \checkmark$ $I = 11,82 \text{ A}$ $R = V/I$ $= 220/11,82 \checkmark$ $= 18,62 \Omega \checkmark$	(4)
	11.2.2	$\text{Cost} = (2,6 \times 3,5) \checkmark \times 1,04 \checkmark = \text{R}9,46 \checkmark$ OR/OF $E = Pt = 2,6 \text{ kW} \times 3,5 \text{ h} \checkmark = 9,1 \text{ kWh}$ $\text{Cost} = 9,1 \text{ kWh} \times \text{R}1,04 \checkmark = \text{R}9,46 \checkmark$	(3)

[16]

TOTAL SECTION/TOTAAL AFDELING B: 125
 GRAND TOTAL/GROOTTOTAAL: 150